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المجلة الصحية لشرق المتوسط

EMHJ

Eastern Mediterranean Health Journal

La Revue de Santé de la Méditerranée orientale

There are just 2 years to go to achieve the MDGs; not all countries in the Region are on track to realize MDG 4 (reducing child mortality) and MDG 5 (improving maternal health). The Dubai Declaration marked the commitment of Member States of the Region to accelerate progress in maternal and child health in order to reach these health goals.

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المجلة الصحية لشرق المتوسط

هى المجلة الرسمية التى تصدر عن المكتب الإقليمى لشرق المتوسط بمنظمة الصحة العالمية. وهى منبر لتقديم السياسات والمبادرات الجديدة فى الخدمات الصحية والترويج لها، ولتبادل الآراء والمفاهيم والمعطيات الوبائية ونتائج الأبحاث وغير ذلك من المعلومات، وخاصة ما يتعلق منها بإقليم شرق المتوسط. وهى موجهة إلى كل أعضاء المهن الصحية، والكليات الطبية وسائر المعاهد التعليمية، وكذا المنظمات غير الحكومية المعنية، والمراكز المتعاونة مع منظمة الصحة العالمية والأفراد المهتمين بالصحة فى الإقليم وخارجه.

EASTERN MEDITERRANEAN HEALTH JOURNAL

IS the official health journal published by the Eastern Mediterranean Regional Office of the World Health Organization. It is a forum for the presentation and promotion of new policies and initiatives in health services; and for the exchange of ideas, concepts, epidemiological data, research findings and other information, with special reference to the Eastern Mediterranean Region. It addresses all members of the health profession, medical and other health educational institutes, interested NGOs, WHO Collaborating Centres and individuals within and outside the Region.

LA REVUE DE SANTÉ DE LA MÉDITERRANÉE ORIENTALE

EST une revue de santé officielle publiée par le Bureau régional de l'Organisation mondiale de la Santé pour la Méditerranée orientale. Elle offre une tribune pour la présentation et la promotion de nouvelles politiques et initiatives dans le domaine des ser-vices de santé ainsi qu'à l'échange d'idées, de concepts, de données épidémiologiques, de résultats de recherches et d'autres informations, se rapportant plus particulièrement à la Région de la Méditerranée orientale. Elle s'adresse à tous les professionnels de la santé, aux membres des instituts médicaux et autres instituts de formation médico-sanitaire, aux ONG, Centres collaborateurs de l'OMS et personnes concernés au sein et hors de la Région.

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المجلة الصحية لشرق المتوسط

EMHJ

Editorial

Less than 1000 days to go for MDGs 4 and 5: where are we and what needs to be done?

Flavia Bustreo[1]

The Millennium Development Goals (MDGs) 4 and 5 called for reducing the mortality of under-5-year-olds by two-thirds between 1990 and 2015, and reducing maternal mortality by three-quarters over the same period. Substantial progress towards this has been made worldwide. The global maternal mortality ratio fell by 47% between 1990 and 2010 and the under-5 mortality rate also fell by 47% between 1990 and 2012 [1,2]. However, there has been insufficient progress and there is a risk that the global targets will not be met. Still every year 6.6 million children die before their 5th birthday, of whom 2.9 million are newborn babies in the first month of life. An estimated 287 000 women die due to the complications of pregnancy and childbirth, and the annual 2.6 million stillbirths are silent tragedies that have to be prevented.

The leading causes of maternal mortality—obstetric haemorrhage, hypertensive disorders of pregnancy, sepsis and unsafe abortion—are to a large extent preventable in most high-burden countries. Certain services are key to preventing maternal deaths, such as contraception, antenatal care, skilled attendance at birth and postnatal care. Likewise, many children still die from easily preventable diseases. Deaths in the newborn period are mostly due to prematurity, sepsis and intrapartum causes, while in the 1–59-month age group it is pneumonia and diarrhoea and high rates of malnutrition which underlie over 45% of all under-5 deaths. In addition, malaria and HIV and AIDS cause significant numbers of deaths in some countries. For those children who survive, malnutrition may jeopardize their potential for optimal growth and development, with significant consequences later in life.

Proven effective interventions exist to further reduce maternal and child mortality [3], and the scaling up of these interventions is critical. However, coverage remains low for many of these interventions and is often not evenly distributed within countries. Recognizing that progress in maternal, newborn and child survival requires reaching all population subgroups with essential health services, health-equity dimensions such as wealth, sex, age, maternal education, ethnicity and urban/rural residence are critical factors to take into account. Analysis of data in the latest Countdown to 2015 report showed pronounced inequities in coverage for many essential interventions, with women and children from richer households much more likely to receive care than those from poorer households [4]. This pattern is particularly evident for interventions that require a fully functional health system, such as having a skilled attendant at the birth.

Multiple global efforts are being made to support countries to accelerate progress and address the "unfinished business" of reducing maternal and child mortality. The United Nations Secretary-General's Global Strategy for Women's and Children's Health, launched in 2010, is an unprecedented plan to save the lives of 16 million women and children by 2015. Under this umbrella, the Commission on Information and Accountability for Women's and Children's Health developed a framework to monitor and track commitments made to the Global Strategy, and an independent Expert Review Group (iERG) reports annually on progress towards implementation of the Commission's recommendations in 75 high-burden countries regarding reporting, oversight and accountability. More recently, a number of initiatives have been launched with the aim of accelerating progress towards MDGs 4 and 5, and to end preventable maternal and child mortality in a generation. The Commitment to Child Survival: A Promise Renewed sets out targets for reduction of child mortality to 20 child deaths or less per 1000 live births by 2035. In support of this target, the Global Action Plan for the Prevention and Control of Pneumonia and Diarrhoea (GAPPD) provides directions for ending preventable child deaths due to pneumonia and diarrhoea through a combination of interventions, such as exclusive breastfeeding and good nutrition, hand-washing, safe drinking-water, improved cooking stoves, zinc supplements and oral rehydration solution, amoxicillin, vitamin A supplements and new vaccines. Likewise, a plan for reducing newborn deaths—Every Newborn: an Action to End Preventable Newborn deaths—is in preparation to address this increasingly important issue. Finally, the Family Planning 2020 (FP2020) initiative at the London Family Planning Summit in 2012 set an ambitious goal to provide an additional

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120 million women in the world's poorest countries with access to voluntary family planning by 2020.

These global initiatives are important drivers for sustained action and commitment for improving maternal and child health and reducing mortality. They cannot stand alone, however. The most critical factor for success is the extent to which follow-up and action is happening at regional and country levels. The WHO Eastern Mediterranean Region (EMR) has taken important steps in this direction. Nonetheless, in the EMR, the average annual rates of reduction in maternal and child mortality between 1990 and 2010 (2% for under-5 mortality rate and 2.6% for maternal mortality ratio) are among the lowest in the world. Some countries have made tremendous progress over the last 20 years. However, the Region is unlikely to achieve the targets of MDGs 4 and 5 by 2015 unless intensive and accelerated progress is made, especially in those countries contributing to the bulk of under-5 and maternal deaths.

It is estimated that 923 000 children under 5 years of age and around 39 000 women of childbearing age still die every year in the Region as a result of pregnancy-related complications. Mortality rates are particularly high in the poor, rural and underserved areas, among malnourished children and pregnant adolescents. In response to that challenge, WHO, United Nations Children's Fund (UNICEF) and the United Nations Population Fund (UNFPA), in collaboration with countries of EMR and partners, have commenced a regional initiative to accelerate progress towards MDGs 4 and 5 focusing on 10 high-burden countries (Afghanistan, Djibouti, Egypt, Iraq, Morocco, Pakistan, Somalia, South Sudan, Sudan and Yemen). A high-level meeting on "Saving the lives of mothers and children: rising to the challenge", held in Dubai, United Arab Emirates on 29 and 30 January 2013, was attended by 150 participants, including 10 ministers of health, senior officials and leading figures from 22 Member States, as well as key partners and stakeholders. Through the Dubai Declaration, countries expressed their commitment to develop and execute plans for maternal and child health; to take measurable steps to strengthen their health systems; and to mobilize domestic and international resources to establish sustainable financing mechanisms.

Encouragingly, following this high-level meeting in Dubai, all 10 countries have developed acceleration plans for MDGs 4 and 5 with support from WHO, UNICEF, UNFPA and other partners. The plans vary from country to country, reflecting their different situations and contexts. However, the plans focus on increasing coverage of the key cost-effective maternal and child health interventions across the continuum of care while addressing inequities in maternal and child health, together with a call for more intersectoral collaboration. The time for implementation of the plans is now.

Getting closer to reaching MDGs 4 and 5 and to reaching the ambitious targets set beyond 2015 will require sustained commitment by all stakeholders. It will also require a strengthening of health systems through allocation of the necessary human and financial resources to mobilize both domestic and international funding. Importantly, however, this should not be viewed as merely an additional cost burden. The health of women and children should be seen as an investment in the future that may also lead to wider societal gains and socioeconomic development.

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Invited review

Reducing the burden of maternal and child morbidity and mortality in the Eastern Mediterranean Region? Yes, we can

Mahmoud Fahmy Fathalla[1]

إنقاص عبء وفيات ومراضة الأمهات والأطفال في إقليم شرق المتوسط؟ نعم، نستطيع ذلك

محمود فتح الله

الخلاصة: تعتبر وفيات ومراضة الأمهات والأطفال في إقليم شرق المتوسط من التحديات الكبيرة التي تواجه الصحة العمومية والتنمية وحقوق الإنسان في إقليم شرق المتوسط لمنظمة الصحة العالمية. فالإقليم واسع التنوع، فيه بلدان مرتفعة الدخل وأخرى متوسطة الدخل وبلدان منخفضة الدخل، ويعاني عدد من بلدانه من عدم الاستقرار السياسي ومن الصراعات ومن التحديات المعقدة في التنمية. ورغم ما تم إحرازه من تقدُّم صوب المرمَيَيْن 4 و5 من المرامي الإنمائية للألفية، فإن ذلك التقدُّم لم يكن متساوياً بين البلدان ولا ضمن كل بلدٍ على حدة. وتقدم هذه الورقة تحليلاً لمواطن الضعف ومكامن القوة، والفرص والتهديدات في المسعى لتحسين وفيات ومراضة الأمهات والأطفال في الإقليم. والجواب للسؤال حول ما إذا كان بمقدورنا إنقاص عبء وفيات ومراضة الأمهات والأطفال في الإقليم هو نعم نحن نستطيع ذلك، إلا أن الالتزام والتعاون مطلوبان على الصعيد الوطني والإقليمي والدولي.

ABSTRACT Maternal and child morbidity and mortality are a major public health, development and human rights challenge globally and in the WHO Eastern Mediterranean Region. The Region is diverse, with high-, middle- and low- income countries, many suffering from political instability, conflicts and other complex development challenges. Although progress has been made towards Millennium Development Goals 4 and 5, it has been uneven both between and within countries. This paper makes an analysis of the strengths, weaknesses, opportunities and threats to improving maternal and child mortality and morbidity with a focus on the Region. In answer to the question whether we can reduce the burden of maternal and child morbidity and mortality in the Region: yes, we can. However, commitment and collaboration are needed at the country, regional and international levels.

La réduction de la charge de la morbidité et de la mortalité maternelles et infantiles est effectivement possible dans la Région de la Méditerranée orientale

RÉSUMÉ La morbidité et la mortalité maternelles et infantiles constituent un défi majeur en matière de santé publique, de développement et de droits de l'homme au niveau mondial ainsi que dans la Région OMS de la Méditerranée orientale. La Région est hétérogène et comprend des pays à revenus élevé, intermédiaire et faible, dont plusieurs connaissent une instabilité politique, des conflits ainsi que d'autres problèmes de développement complexes. Malgré les progrès accomplis vers la réalisation des objectifs du Millénaire pour le développement 4 et 5, des inégalités ont été observées aux niveaux régional et national. Le présent article analyse les forces, faiblesses, opportunités et menaces en matière d'amélioration de la mortalité et de la morbidité maternelles et infantiles dans la Région. La réponse à la question de savoir si nous pouvons effectivement réduire la charge de la morbidité et de la mortalité maternelle et infantile dans la Région est affirmative. Un engagement et une collaboration sont néanmoins nécessaires aux niveaux national, régional et international.

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The challenge

It is estimated that every year in the WHO Eastern Mediterranean Region (EMR) around 923 000 children under 5 years of age still die as a result of common childhood diseases and 39 000 women of childbearing age die as a result of pregnancy-related complications [1]. Mortality figures are indicative of a much greater magnitude of morbidity and disability. Maternal and child mortality and morbidity are not only a major public health challenge in the Region and worldwide, they are also a development challenge, explicitly highlighted as 2 of the 8 Millennium Development Goals (MDGs) [2]. Safe motherhood is also a human right of women that should be respected, protected and implemented [3].

EMR is a diverse region that includes high-income countries in which socioeconomic development has progressed considerably over the last 4 decades; middle-income countries which have well-developed health service delivery infrastructures but face resource constraints; and low-income countries which lack resources for health. Many countries of the Region are suffering from political instability, conflicts and other complex development challenges.

Progress in the Region towards the MDGs has been variable [4]. MDG 4, relating to reduction of under 5 mortality, has been achieved by 4 countries only, while another 9 countries are on track and 10 countries are unlikely to achieve the goal, based on current trends. MDG 5, relating to reduction in maternal mortality, has been achieved by 6 countries, while 8 countries are on track and 9 are not expected to achieve the goal, based on current trends. Worldwide, of the 75 countries where more than 95% of all maternal and child deaths occur, 10 countries are from the Region: Afghanistan, Djibouti, Egypt, Iraq, Morocco, Pakistan, Somalia, South Sudan, Sudan and Yemen [5].

Can we reduce the unacceptable burden of maternal & child morbidity and mortality in EMR?

To answer this question we need to undertake a SWOT analysis, to examine our strengths, weaknesses, opportunities and threats, a technique widely used in the business world [6]. Apart from answering the question of feasibility of achieving the goals, the analysis will be useful in guiding the strategy to deal with the challenge. The analysis presented here is not meant to be comprehensive. The aim is to highlight some salient areas for each element of the analysis.

Strengths

Two areas of strength give us encouragement and confidence. First, evidence-based interventions are already known, have been tested, have been shown to work and can have an impact. Secondly, many countries worldwide in similar socioeconomic situations have achieved success.

Evidence-based interventions are already known

Evidence-based packages of interventions are already available in a continuum of care for maternal and child health [7]. For safer motherhood, pregnancy must be a voluntary choice for the woman and she should have access to prenatal care, delivery by skilled birth attendants and life-saving emergency obstetric care if needed [8]. Evidence-based interventions are available to deal with the main causes of under-5 child mortality: diarrhoea, pneumonia, measles, malaria, HIV/AIDS, birth asphyxia, preterm delivery, neonatal tetanus and neonatal sepsis. Child survival interventions are feasible to deliver with high coverage in low-income settings [9].

While all elements of the evidence-based packages should be implemented in the Region, 2 areas need more emphasis: family planning and perinatal health. Family planning has an impact on mother and child, apart from other benefits. An unmet need for family planning, particularly for modern methods and for spacing and/or limiting of childbearing, has been demonstrated in countries of the Region where demographic and health surveys have been conducted. The unmet need for family planning ranged from 8% to 20% of married women of reproductive age of known fertility [10]. Childhood deaths in EMR are increasingly concentrated in the first month of life [5] and evidence-based interventions need to be intensified to reduce perinatal mortality.

Progress has been made

Between 1990 and 2011, under-5 mortality declined in EMR by 41%, maternal mortality declined by 42% between 1990 and 2010, and the Region witnessed a number of success stories [1]. Exchange of experiences and mutual learning between countries can pay dividends .

Weaknesses

Two areas of weakness in the EMR should be taken into consideration and need to be addressed. The first is the constraints of the health-care systems. The second is the lack of evidence-based information from countries to guide policy- and decision-making.

Health care systems

Health systems in the Region face many challenges that are generally cross-cutting in nature and apply to most countries irrespective of socioeconomic and health status of their populations [11]. The 3 main inputs needed for a health-care system to function are: human capital, physical capital and consumables [12]. An appropriate balance between these inputs is necessary for good functioning of the system. Investments in these are often imbalanced, however, particularly in countries with limited resources. The bias is towards an

increased investment in physical capital, at the expense of human capital and consumables. Governments and external aid agencies have contributed to this unbalanced input mix by focusing on highly visible investments without adequate consideration of the need for other investments and the recurrent costs that ensure proper functioning of the system [12]. A health-care system that is sound in structure may not be sound in function, as the experience in some countries has demonstrated [13]: "Good anatomy does not mean good physiology" [14].

The overall health workforce density in the Region is below the global average of 4 skilled health workers per 1000 population. Eight countries (Afghanistan, Djibouti, Iraq, Morocco, Pakistan, Somalia, Sudan and Yemen) are classified as facing a crisis in human resources for health [15].

Evidence-based information for policy- and decision-making

Almost 40% of countries in the Region have inadequate or weak civil registration mechanisms and vital statistics, and only 25% have satisfactory systems. Overall, these systems serve only 5.3% of the population in the Region [15].

The Commission on Information and Accountability proposed the following core indicators to monitor the impact of interventions and development of programmes: maternal mortality ratio; under-5 mortality rate and the proportion of newborn deaths; children under 5 years of age who are stunted; demand for family planning satisfied (met need for contraception); adequate antenatal care coverage (at least 4 visits during pregnancy); availability of antiretroviral prophylaxis for HIV-positive pregnant women to prevent mother-to-child transmission of HIV and antiretroviral therapy for HIV-positive pregnant women who are treatment-eligible; skilled attendant at birth; postnatal care for mothers and babies within 2 days of birth; exclusive breastfeeding for the first 6 months of life; 3 doses of combined diphtheria-tetanus-pertussis immunization coverage; and availability of antibiotic treatment for pneumonia [5].

When data are collected, they should be viewed and analysed through an equity lens. National averages and overall coverage rates can mask gross inequities. Inequities in health represent the most important challenge facing many countries of the Region [4]. Inequity is particularly evident for interventions that require a functioning health system. Countries achieving rapid progress in intervention coverage have accomplished this primarily by improving coverage in the poorest wealth quintiles [5].

Even when national information systems are lacking, some information can still be gathered and put to use to guide practices, decisions and policies. Confidential enquiries into the causes of cases of maternal mortality provide one such model. They can be conducted at the community, health care facility, district, regional or national level [16]. Experience has shown that the use of these reviews can have a significant impact even without any substantial increase in public expenditure.

Opportunities

Scientific research, including health systems research, is providing opportunities that can be seized to improve the coverage of maternal and child health services in EMR. These include innovations in technologies appropriate for low-resource settings, and improving service delivery and coverage through task shifting and mobile health initiatives.

Innovations in appropriate technology

Low-cost innovations, made more available in low-resource countries, can contribute to saving the lives of mothers and children [17]. These include, among others: the non-pneumatic anti-shock garment to slow excessive bleeding after childbirth and stabilize the mother until she can be treated at an emergency care facility; magnesium sulphate, at a cost of less than a dollar per dose, to prevent and treat life-threatening convulsions among women with severe pre-eclampsia and eclampsia; chlorhexidine, a low-cost antiseptic to reduce the risk of life-threatening infections via the newly cut umbilical cord; and Rotavac®, an affordable new vaccine to protect children from rotavirus infection, a top cause of deadly diarrhoea in developing countries. So-called "kangaroo care", a way of holding a preterm or full-term infant so that there is skin-to-skin contact between the infant and the person holding it, can be an alternative to neonatal intensive care incubators [18].

Task shifting

Access to care may be improved by training and enabling mid-level and lay health workers to perform specific interventions that might otherwise be provided by cadres of workers with longer and/or more specialized training. Such task-shifting strategies might be particularly attractive to EMR countries which lack the means to improve access to care within a short period of time. A WHO Guidance Panel made 119 recommendations for appropriate task shifting: 36 for lay health workers, 23 for auxiliary nurses, 17 for auxiliary nurse midwives, 13 for nurses, 13 for midwives, 8 for associate clinicians, 8 for advanced level associate clinicians and 1 for non-specialist doctors [19].

Lay or community health workers, who have not received a formal professional or paraprofessional certificate or tertiary education degree, can be trained and utilized, according to the WHO report, to promote the uptake of maternal and newborn-related health care behaviour and services, to provide continuous social support during labour (in the presence of a skilled birth attendant) and to administer misoprostol to prevent postpartum haemorrhage when

skilled birth attendants are not present and oxytocin is not available [20].

A number of countries in sub-Saharan Africa have successfully used non-physicians to perform major emergency obstetrical surgery. In Tanzania, for example, assistant medical officers provide most of this surgery outside of major cities. Studies have demonstrated no significant differences between the care of assistant medical officers and medical officers in terms of outcomes, risk indicators or quality of care [21].

Mobile health (mHealth)

With over 6 billion mobile phone subscriptions spread across a world population of over 7 billion, mobile technologies are rapidly penetrating even the most remote corners of the world. For women and newborns in many low- and middle-income countries, the rapid expansion of mobile phone technology infrastructure presents an unprecedented opportunity to increase access to health care and to save lives [22,23]. Women can be provided with information services by phone. Community-based health workers can be provided with point-of-care decision support tools. Data can also flow through a health system in real-time, and deliver critical information to support women's and providers' needs in a timely and efficient manner. At this time, although mHealth applications are in the formative stage, the evidence for their effectiveness and impact is growing rapidly.

Threats

Two particular categories of threats in the EMR may be impeding progress towards MDGs 4 and 5. The first includes natural disasters, armed conflicts, and political insecurity and instability. The second is emergence of new health threats. These threats can have a dual impact on maternal and child health: a direct impact on mothers and children who are vulnerable population groups, and an indirect impact by diverting the often limited resources available for maternal and child health.

The threat of natural and man-made disasters

EMR is a high-risk region for natural hazards such as earthquakes, floods and drought. Political instability and civil conflict are posing new threats. In the past 2 years, 13 countries in the Region have experienced such emergencies, with more than 42 million people affected [15]. Emergency preparedness and response are a priority area for countries in EMR. Disasters, whether natural, or man-made as is often the case, will adversely affect the implementation and achievements of child and maternal health programmes.

Vaccination against poliomyelitis is an example of how armed conflict, insecurity and political instability hinder universal coverage. All countries of the Region are free from polio, except Afghanistan and Pakistan, where conflict, access problems and disinformation among the population have hindered progress in the countries and are posing the threat of spread to other polio-free countries [24].

Emergence of new health threats

The HIV epidemic has continued to spread through the Region. Although the overall prevalence in the general population is still low, the proportion of newly infected people among all people living with HIV is the highest globally [1]. Where it is prevalent, HIV infection will be an important cause for child and maternal mortality. It can also drain resources from maternal and child health programmes. HIV worldwide has a vocal advocacy constituency, which maternal and child health do not have. The Accountability Commission report for 2013 cites such an example [5]. Although most of the countries reviewed began with low coverage levels for care-seeking for pneumonia and for prevention of mother-to-child transmission of HIV, after 5 years the coverage was considerably greater for HIV prevention in every country. Some countries even experienced drops in coverage for pneumonia. The report noted that this was in spite of the fact that pneumonia and diarrhoea together account for 2 million child deaths each year (nearly 15 times the number of child deaths caused by AIDS). The message is not about cutting the resources allocated for HIV, but to call for the same level of attention to be extended to other leading killers of women and children.

Another emerging health threat that is causing considerable concern in the Region is the Middle East respiratory syndrome coronavirus [25].

Yes, we can

This analysis of the strengths, weaknesses, opportunities and threats answers the question whether we can reduce the burden of maternal and child morbidity and mortality in the Region: yes, we can. But the conclusion has to be qualified. We can, provided we have the commitment and we collaborate together at the country, regional and international level towards the objective.

A solemn commitment to collaboration was made on 30 January 2013 in Dubai, when the ministers of health and delegates of countries of the EMR, representatives of United Nations agencies and international, regional and national institutions participating in the High-level Meeting on Saving the Lives of Mothers and Children: Rising to the Challenge, pledged to "accelerate progress on maternal, newborn, child and adolescent health through national action and international cooperation, to hold themselves accountable for collective progress towards this goal, and on behalf of all mothers, adolescents and children in the Region, recommit to give every woman the best opportunity for safe delivery so that every child has the best possible start in life" [26].

Competing interests: None declared.

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Community participation eludes Pakistan's maternal, newborn and child health programme

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المساهمة المجتمعية تتفلَّت من برنامج صحة الأمهات والولدان في باكستان

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الخلاصة: تدرس هذه الورقة مدى شمولية أسلوب الرعاية الصحية الأولية في برنامج صحة الأمهات والولدان والأطفال في باكستان والذي انطلق عام 1997. وتتضمَّن طريقة الدراسة استعراض وثائق الدلائل الإرشادية في البرنامج، وإجراء مقابلات معمقة مع المديرين والمشاورين، وإجراء مناقشات في مجموعات من المجتمع المحلي ومن مقدِّمي الخدمات. ويطبِّق برنامج صحة الأمهات والولدان والأطفال في باكستان نموذجاً أولياً مختاراً، ويبدي مديرو البرنامج ومستشاروه قلقهم حول جودة التدريب والتدخل السياسي والتنفيذ غير المستكمل؛ كما أن مقدِّمي الخدمة لم يعملوا بعضهم مع بعض كما هو متوقع. واشتكت القابلات المجتمعيات من ما لدى المجتمع المحلي من تصورات نحوهن. ولم يكن أعضاء المجتمع المحلي على علم بتنفيذ البرنامج في المناطق التي يعيشون فيها. ويحتاج برنامج الصحة الأولية في باكستان للمراجعة وللتنقيح وفق الطريقة التي يفكر بها الناس حالياً حول مدى إسهام المجتمع والتعاون بين القطاعات من أجل تسريع وتيرة التقدُّم صَوْب بلوغ المرمَيَيْن 4 و5 من المرامي الإنمائية للألفية.

ABSTRACT This study looked at the comprehensiveness of the primary health care approach being applied in Pakistan's National Maternal, Newborn and Child Health (MNCH) Programme launched in 2005. The methods included a review of the programme's guideline documents, in-depth interviews with managers/advisors and focus group discussions with community groups and service providers. The MNCH Programme is applying a selective primary care model. Programme advisors and managers were concerned about the quality of training, political interference and incomplete implementation. Service providers were not working together as envisioned. Community midwives complained about the community's perceptions of them. Community members were unaware of MNCH Programme implementation in their areas. Pakistan's primary health care programme needs to be reviewed and revised according current thinking on community participation and inter-sectoral collaboration to accelerate progress towards achievement of Millennium Development Goals 4 and 5.

La participation communautaire absente du programme de santé de la mère, du nouveau-né et de l'enfant au Pakistan

RÉSUMÉ La présente étude a examiné le caractère exhaustif de l'approche des soins de santé primaires actuellement appliquée au sein du programme national de santé de la mère, du nouveau-né et de l'enfant qui a été lancé en 1997 au Pakistan. La méthode employée comprenait un examen des lignes directrices, des entretiens approfondis avec des administrateurs et conseillers ainsi que l'organisation de groupes de discussions avec les groupes communautaires et les prestataires de services. Le programme de santé de la mère, du nouveau-né et de l'enfant applique un modèle de soins primaires sélectifs. Les conseillers et administrateurs du programme étaient inquiets au sujet de la qualité de la formation, de l'ingérence politique et de la mise en œuvre incomplète du programme. Les prestataires de services ne travaillaient pas ensemble, comme il avait été initialement prévu. Les sages-femmes communautaires se sont plaintes de la perception de la communauté vis-à vis de leur profession. Les membres de la communauté n'avaient pas connaissance de la mise en œuvre du programme de santé de la mère, du nouveau-né et de l'enfant dans leur région. Le programme de soins de santé primaires du Pakistan doit être examiné et révisé conformément à la pensée actuelle en matière de participation communautaire et de collaboration intersectorielle afin d'accélérer les progrès en vue de la réalisation des objectifs du Millénaire pour le développement 4 et 5.

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Introduction

Primary health care (PHC), as envisioned at the Alma-Ata international conference, explicitly outlined a comprehensive strategy that emphasized health promotion and disease prevention, community participation, self-reliance and intersectoral collaboration [1]. Experts at the time, however, considered comprehensive PHC as idealistic and too expensive for developing countries, and favoured a disease-focused, selective approach to PHC [2]. This is the approach applied in Pakistan's health policies and strategies. There is evidence now that the selective approach has failed to deliver, and there have been calls for revisiting the comprehensive PHC approach [3]. The World Health Organization's (WHO) *World Health Report* 1998 underscored the role of PHC in addressing growing health inequities and emphasized community participation, a multisectoral approach and appropriate technology as the 3 prerequisites for the success of the PHC system [4]. The *World Health Report* 2008 advised countries to adopt comprehensive PHC and make their health systems people-centred and participatory [5].

It is now widely accepted that community participation is necessary for achieving health service sustainability [6–8], as a means to cost-effectively achieving project objectives and as an empowerment tool enabling communities to take control of their own development [7]. Assessing the role of community participation in achieving health improvements is an ongoing challenge, largely due to the multiplicity of definitions [9]. Indicators of successful participation include interest in participation, communication and information transfer, responsiveness, motivation, accountability, sustainability, control over resources and experience of participation [10].

Pakistan has implemented a succession of programmes to improve the health indicators of its population and has recently accelerated its efforts to achieve Millennium Development Goals (MDGs) 4 and 5 to reduce child mortality and improve maternal health [11]. The results are modest and the country is not likely to achieve MDGs 4 and 5 by 2015. Furthermore, there is little quality data from within the country to identify the factors impeding the performance of maternal and child health programmes. The study reported here was undertaken with the aim of determining the level of community participation achieved in the Government of Pakistan's National Maternal, Newborn and Child Health (MNCH) Programme launched in 2005 [12,13]. This Programme aimed to accelerate progress towards achievement of MDGs 4 and 5 by achieving functional integration of all the ongoing maternal and child health programmes with the overarching goal of improving accessibility to quality MNCH services. A key strategy of the Programme was the introduction of a new cadre of community health workers called community midwives (CMWs). Our study aimed to assess the effectiveness of the Programme's implementation strategies in introducing this new and unfamiliar cadre to the community and in promoting their acceptance and utilization by the community.

Methods

Study design and setting

The study was undertaken in the Mardan district of Khyber Pakhtunkhwa province. Data were collected from July to August 2011 through in-depth interviews and focus group discussions (FGDs). The research team included a qualitative research consultant (female), 2 lecturers in public health (female) and an assistant director of research and development (male) at Khyber Medical University. The consultant trained and supervised the research team.

Data sources

Data sources included MNCH Programme guideline documents; advisors, managers and service providers; women who had delivered babies during a defined 6-month period and mothers-in-law of the women; and members of the community whose opinions and practices influenced other community members (community opinion-makers). Service providers included the new CMWs, as well as lady health workers (LHWs) and lady health visitors (LHVs). Community opinion-makers included politicians, landowners, government officials, schoolteachers, religious teachers, journalists and women entrepreneurs.

Data collection

Table 1 outlines the objectives, methods and sample selected for the study. FGDs were undertaken with the following groups: LHWs; LHVs; female opinion-makers; male opinion-makers; and poor mothers and mothers-in-law (defined according to monthly income of < Rs 5000, quality of house, ownership of house, known to be poor by local field assistants). A total of 14 FGDs were undertaken with 94 participants. One team member moderated the discussion and one made handwritten notes. A total of 15 indepth interviews with policy-makers and managers were completed; 13 were face-to-face and 2 were telephone interviews. Three interviews were done with CMWs with whom a planned FGD could not be arranged owing to their absence from their assigned areas.

The following MNCH Programme policy and strategy documents were examined:

Table 1 Objectives, methods and sample selected for the study to assess the effectiveness of the implementation of Pakistan's Maternal, Newborn and Child Health (MNCH) Programme

Objectives	Data type	Sample
• Determine the role assigned to the community in the CMW Programme policy, planning and implementation strategies	• Secondary data: document search and analysis	• Guiding documents identified in Research and Advocacy Fund document *Maternal and newborn health—the policy context in Pakistan* [13]
• Assess the perceptions of Programme policy-makers and managers towards the role of the community in the Programme • Record managers' views and suggestions for establishing the role of the community in the Programme • Evaluate the criteria used for candidates' selection for training as related to sociocultural norms and practices • Determine community representation in the structures established for implementation of the CMW programme—selection methods, supervision and monitoring • Determine the role assigned to the community in conflict resolution and accountability of CMWs • Identify the different mechanisms in place for pay and incentives to CMWs	• Qualitative data: in-depth interviews with health and MNCH Programme managers and health and population professionals associated with MNCH Programme	• Available health and MNCH Programme managers. Other professionals associated with MNCH Programme were identified by Programme managers • Planned to interview 18 people; interviewed 15 (national MNCH Programme managers became unavailable owing to devolution; provincial MNCH Programme managers were unavailable owing to an official inquiry)
• Get feedback from CMWs regarding community's attitudes, acceptability and utilization of their services • Record CMWs' views and suggestions on community participation	• Qualitative: FGD with a group of 10–12 CMWs (not done)	• No group was selected owing to absence of CMWs in the study union councils
• Determine the status of CMWs in the community • Record community's perspectives on its role in the CMW programme • Document community suggestions about institutionalization of the CMW programme	• Qualitative: FGD with community groups, LHWs and LHVs.	• 14 FGD done: 4 with women opinion-makers; 4 with male opinion-makers; 2 with poor mothers and mothers-in-law; 2 with non-poor mothers and mothers-in-law; 1 with LHWs; 1 with LHVs
• Compare the level of satisfaction of mothers with the care provided by CMWs and other MCH providers • Get feedback from relevant stakeholders in the community on the quality and cost of care provided by the CMWs and other service providers	• Quantitative: women who had deliveries after CMWs were deployed. FGD with mothers and mothers-in-law.	• All women who delivered in the period 01/10–31/03/11 were identified and selected for interviews. Total 757 women

CMWs = community midwives; LHWs = lady health workers; LHVs = lady health visitors; MCH = maternal and child health; FGD = focus group discussions.

National Health Policy 2001; *Population Policy 2002*; *Ten-Year Perspective Development Plan 2001–2011*; *National MNCH Communication Strategy Framework*; and *MNCH Programme Planning Commission 1 (PC-1)* document. After devolution of health to the provinces in 2012 and integration of the national MNCH Programme into the provincial health sector these documents are no longer available online, although a mid-term evaluation of the Programme has been published [13].

Data analysis

The conceptual framework given in Table 2 was developed to guide data analysis as regards levels of community participation. The framework for document analysis included a statement about the perceived need for community participation, conceptualization and definition of community participation, the level of participation aimed to be achieved and the objective to be achieved through participation. Data from other sources were analysed for opinions and perceptions of the MNCH

Table 2 Conceptual framework of levels of community participation in health programmes

Level of participation	Process	Outcome
Ownership (the ideal) ↑	Community takes full responsibility as owner and implementer. Government becomes facilitator	Full community empowerment for decision-making/self-reliance
Partnership/ contribution ↑	Community recognized as a partner. Community contributes to costs and infrastructure	High level of empowerment. Community involved in decision-making
Involvement ↑	Community recognized as facilitator involved in selection, monitoring, security and accountability	Community empowered to a limited extent
Awareness ↑	Community recognized as a utilizer of services only	Community becomes "aware utilizer" of services
Passive utilization ↑	No recognition of community role. Community is passive utilizer of services	No community empowerment

Programme and the role of the community in PHC programmes.

Results

The data analysis was explored in 4 themes: guideline documents; MNCH Programme advisors' and managers' perspectives; service providers' perspectives; and opinion-makers' perspectives.

Theme 1: Commitment to and conceptualization of the PHC approach & community participation in MNCH Programme guideline documents

The MNCH Programme guideline documents showed a disconnect between vision, goals and strategies. The *National Health Policy 2001* takes the Health for All goal as its vision and PHC and gender equity as major areas of focus. The policy fails to define either of these concepts and its 10 target areas are focussed on technical strengthening of health services at the primary and secondary levels. No explicit mention of community participation is made (Table 3). Dissemination of information, development of interpersonal skills of community-based workers and participation of civil society organizations are mentioned as strategies for creating mass awareness on "public health matters". There is no mention of any collaboration of the MNCH programme, developed and implemented by the Ministry of Health, with the functionally related Population Welfare Ministry, which had overlapping responsibilities towards reproductive health and population control.

Analysis of the document *Population Policy 2002* showed that the policy is "designed to achieve social and economic revival by curbing rapid population growth and thereby reducing its adverse consequences for development". Important strategies include integration of reproductive health services with family planning. Community participation is limited to awareness creation.

The *MNCH Policy and Strategic Framework* document lists "lack of community involvement in planning, implementation and accountability" and "emphasis on biological determinants and not on cultural and social aspects" as key governance issues but the recommended strategies fail to address these concerns. Community participation is limited to awareness creation.

Table 3 Commitment to and conceptualization of community participation in Pakistan's National Maternal, Newborn and Child Health (MNCH) Programme guideline documents

Document	Felt need for participation	Concept and definition	Level of participation envisioned	Objective to be achieved through participation
National Health Policy 2001	Nil	Nil	Awareness creation	Behaviour change and enhanced utilization of services
Population Policy 2002	Nil	Nil	Awareness creation	Increased contraceptive use
MNCH Policy and Strategic Framework 2005	Stated	Nil	Awareness creation	Utilization of services
National MNCH Communication Strategy	Stated	Nil	Awareness creation and community involvement	Utilization of services and behaviour change
National MNCH Programme PC-1	Stated	Nil	Awareness creation and community involvement	Utilization of services and behaviour change

PC-1 = Planning Commission 1.

Table 4 Implementation of Pakistan's National Maternal, Newborn and Child Health (MNCH) Programme Planning Commission 1 (PC-1) strategies: selection of community midwives (CMWs) and coordination with lady health workers (LHWs)

PC-1 strategies	Implementation status
Selection of CMWs	

CMWs shall be selected from rural areas	• Candidates are selected from urban areas based on:
	  • False documents
	  • Political influence
	  • Interest in monetary benefits by politically selected candidates

Female, preferably married, will be selected	• There are few suitable candidates • "There is no sincere effort" • Politically selected candidates are unmarried • Unmarried women leave assigned location after marriage
Overall impression of the selection process	• Selection criteria are not followed • There is political interference • Stipend of Rs 3500 of trainee CMWs is the reason for political interference • "If the provincial managers are politically appointed, how can it be expected that they will not to be influenced politically in the selection of CMWs?"
Coordination between CMWs and LHWs	
LHWs will introduce the CMWs to the community and refer cases to them	• LHWs did not know the CMWs working in their assigned areas • CMWs reported lack of cooperation from LHWs
LHWs and CMWs will develop referral and transport networks in collaboration	• Professional jealousy reported between LHWs and CMWs • LHWs wanted to become CMWs • LHWs attended deliveries

LHWs and CMWs will hold planning workshops supported by experts from MNCH Programme to mobilize the community for establishing referral and transport linkages	• These workshops were not held:
	  • Money was not released
	  • District-level MNCH Programme managers did not have capacity to lead this community-oriented process

PC-1 = Planning Commission 1.

The *MNCH Programme Planning Commission 1* document involves the community in the verification process of applicants and selection for CMW training. The document also prescribes the holding 5-day planning workshops at district level to mobilize the community for establishing referral and transport linkages.

Theme 2: MNCH Programme advisors' and managers' perspectives on the adequacy of the MNCH Programme strategy and implementation mechanisms and on community participation

All the MNCH Programme advisors and managers were satisfied with the role given to the community in the MNCH Programme documents and strategies. The 2 district level managers expressed concerns about political interference, quality of training and issues related to the integration of MNCH services at the district level. They also revealed the issue of non-payment of salaries to deployed CMWs and delays in the release of funds for programme implementation.

Theme 3: Service providers' perspectives regarding MNCH Programme and community participation in the Programme

Service providers were concerned about the selection process for CMWs and the integration of MNCH at the district level (Table 4). The selection process was reported to be in violation of criteria detailed in the *MNCH Programme PC-1* document. LHWs expressed ignorance about the presence of CMWs, and CMWs reported lack of cooperation from LHWs.

Theme 4: Community awareness about MNCH Programme and views on their role in PHC programmes

Most opinion-makers expressed ignorance about the implementation of MNCH Programme in their areas. One participant, who knew a CMW, reported that she was working with an NGO and not in her assigned area. A women participant had a good opinion of a CMW she knew and according to her, "CMWs deal kindly with all sorts of patients whether rich or poor, and their behaviour is good with everyone". Not much knowledge or perspective emerged as regards the community's role in health programmes. The participants mostly expressed their needs

and expectations. These included accessibility, affordability, compassion from services providers and respect for patients' privacy.

Discussion

This study found many issues in Pakistan's MNCH Programme that are likely to impede the achievement of the programme's objective of achieving MDGs 4 and 5. The Programme is focussing on increasing the number of skilled birth attendants, availability of technology and management improvement. Community participation is limited to awareness creation. Even this selective PHC approach is not being implemented effectively. Integration of MNCH services has not happened. A situation of competing interests has developed among LHWs, LHVs and CMWs. The Programme premise that these service providers will work in coordination has proved erroneous because they have overlapping skills and roles. This issue was identified in a study in Karachi which advised that clearly defined roles should guide the work of community-based workers [14].

The issue of payment of salaries to CMWs is emerging as a threat to the sustainability of the programme. Who should be paying community health workers such as the CMWs is an unresolved issue. Community health workers are usually volunteers selected by the community and accountable to the community. If the government pays them, their accountability to the community cannot be assured. However evidence from other south Asian countries shows that if they are not paid a regular salary they are likely to stop working [15]. Our study verifies this concern. There is a need for resolving this dilemma through consultations and testing of models for community health workers remuneration.

The reported political interference in the MNCH Programme is another unresolved governance health-care issue especially in developing countries [16]. Although the problem is widely known and criticized, there is little research on the issue. The reported influence on the selection of MNCH Programme managers and CMWs by politicians is likely to negatively affect their acceptance by the community and their accountability to the community. This in turn is likely to compromise the effectiveness of the MNCH programme. Our findings regarding the management issues of the MNCH Programme are mirrored in the Oxford Group 2009 review of Pakistan's National Programme for Family Planning and Primary Health Care [17]. The review found incomplete implementation of the directions and key activities of the strategic plan and PC-1 of the Programme owing to absence of strategic review mechanisms and high management turnover.

Conclusions

From this study it can be concluded that Pakistan's MNCH Programme is performing sub-optimally. The Programme is rooted in the selective PHC approach, with a focus on technologies and service provision. Pakistan's health policy-makers, planners and managers need to familiarize themselves with the current thinking on PHC, promoting the 3 essential approaches: community participation, intersectoral collaboration and evidence-based decision-making. The current PHC programmes need to be reviewed and revised accordingly to accelerate progress towards the achievement of the MDGs.

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Expanding the comprehensive national neonatal screening programme in the United Arab Emirates from 1995 to 2011

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توسيع نطاق برنامج وطني شامل لتحري الولدان في الإمارات العربية المتحدة 1995–2011

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الخلاصة: يتضمَّن البرنامج الوطني لتحري الولدان في الإمارات العربية المتحدة في الوقت الحاضر تحري 16 اضطراباً: قصور الغدة الدرقية الخلقي، أمراض الخلية المنجلية، فرط تنسج الكظر الخلقي، عوز إنزيم البيوتينيداز واضطرابات 12 حمضاً أمينياً وحمضاً عضوياً وحموضاً دهنية. وتقدم هذه الورقة تقريراً عن المعطيات حول البرنامج منذ بدئه في كانون الثاني/ يناير 1995 وحتى كانون الأول/ ديسمبر 2011، ويتناول معدل حدوث الاضطرابات التي يتم تحريها، والأسس الجزيئية للحالات الإيجابية التي تم تحريها. ويستخدم في التحري مزيج من قياس الطيف الكتلي المتراصف، والتكنولوجيات الجزيئية، والتحليل الكيميائي الحيوي. وقد تم تحري 365 750 طفلاً، وتم إنقاذ 717 طفلاً منهم من المراضة أو الوفيات المرافقة. واتضح أن معدل حدوث الاضطرابات التي تم تحريها 1 إلى 873 1 بالنسبة لقصور الغدة الدرقية الخلقي؛ و1 إلى 544 14 بالنسبة إلى بيلة الفينول كيتون في البول، 1 إلى 526 3 بالنسبة لاضطرابات الحموض الأمينية والحموض العضوية والحموض الدهنية؛ و1 إلى 030 9 بالنسبة لفرط تنسج الكظر الخلقي؛ و1 إلى 300 8 بالنسبة لعوز إنزيم البيوتينيداز، و1 إلى 384 2 بالنسبة لمرض الخلية المنجلية و1 إلى 121 بالنسبة إلى خَلَّة الخلايا المنجلية. واتضح أن التغطية بمسح الولدان بين السكان وقد وصلت في عام 2010 إلى 95٪.

ABSTRACT The national neonatal screening programme in the United Arab Emirates currently includes 16 disorders: congenital hypothyroidism, sickle-cell diseases, congenital adrenal hyperplasia, biotinidase deficiency and 12 amino acid, organic acid and fatty acid disorders. This paper reports data since the programme started in January 1995 up to December 2011 on the incidence of screened disorders and the molecular basis of positive screened cases. Screening used a combination of tandem mass spectrometry, molecular technologies and biochemical analysis. A total of 750 365 infants were screened and 717 babies saved from associated morbidity and/or mortality. The incidence of screened disorders were 1:1 873 for congenital hypothyroidism, 1:14 544 for phenylketonuria, 1:3 526 for amino acid, organic acid and fatty acid disorders, 1:9 030 for classical congenital adrenal hyperplasia, 1:8 300 for biotinidase deficiency, 1:2 384 for sickle-cell disease and 1:121 for sickle-cell traits. Coverage of neonatal screening in the population reached 95% in 2010.

Extension du vaste programme national de dépistage néonatal aux Émirats arabes unis de 1995 à 2011

RÉSUMÉ Le programme national de dépistage néonatal aux Émirats arabes unis couvre actuellement 16 maladies ou troubles : l'hyperthyroïdie congénitale, la drépanocytose, l'hyperplasie congénitale des surrénales, le déficit en biotinidase ainsi que 12 troubles des acides aminés, organiques et gras. L'article présente les données collectées, depuis le commencement du programme en janvier 1995 jusqu'en décembre 2011, sur l'incidence des troubles dépistés ainsi que la base moléculaire des cas positifs dépistés. La spectrométrie de masse en tandem, les technologies moléculaires et l'analyse biochimique ont été utilisées pour les besoins du dépistage. Au total, 750 365 nourrissons ont été dépistés et la morbidité et/ou mortalité associée a pu être évitée pour 717 bébés. L'incidence des maladies ayant fait l'objet d'un dépistage était la suivante : 1 : 1873 pour l'hyperthyroïdie congénitale, 1 : 14 544 pour la phénylcétonurie, 1 : 3526 pour les troubles des acides aminés, organiques et gras, 1 : 9030 pour la forme classique de l'hyperplasie congénitale des surrénales, 1 : 8300 pour le déficit en biotinidase, 1 : 2384 pour la drépanocytose et 1 : 121 pour les traits drépanocytaires. En 2010, la couverture de la population par le dépistage néonatal avait atteint 95 %.

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Introduction

The concept of screening newborns no longer refers only to the screening tests themselves but includes all of the elements essential for every neonate to have access to a screening system that is optimal in terms of quality and performance [1].

The United Arab Emirates (UAE) has a universal neonatal screening programme which started in January 1995 with screening for phenylketonuria (PKU) followed by the introduction of congenital hypothyroidism (CH) screening in January 1998. A sickle-cell disease (SCD) screening was begun as a pilot study in January 2002 before expansion in March 2005 to the national level. Congenital adrenal hyperplasia (CAH) screening also started as a pilot study in January 2005 before expansion to the national level in 2007. Screening for biotinidase deficiency was originally piloted in January 2010. Tandem mass spectrometry (MS/MS) technology expands the metabolic disorder screening panel and can reliably analyse approximately 50 metabolites in a single short-duration run of about 2 minutes and provide a comprehensive assessment from a single blood-spot specimen [2]. MS/MS was started in the UAE from March 2011 to screen for 12 amino acid, organic acid and fatty acid disorders.

The aim of the current study was to report data from the screening programme on the incidence of PKU, CH, CAH, SCD/trait, biotinidase deficiency, amino acid disorders, organic acid disorders and fatty acid disorders. It also aimed to identify the molecular basis of positive screened cases.

Methods

The sample forms were collected from the various maternal and child health centres throughout the UAE. The data from these forms and the results of the screening were statistically analysed in the computer section of the national screening programme. The screening protocol utilized a combination of MS/MS, molecular technologies and biochemical analysis.

Screening procedures

In the UAE, every baby born in hospital (around 80 000 babies with 99.9% hospital deliveries in 2010) is given a specific neonatal screening form and an information leaflet. The mother is asked to take her baby to the nearest screening centre, usually the maternal and child health (MCH) centre of that district. The baby attends the designated centre on the third day after birth (≥ 48 hours) and blood is collected by heel-prick onto filter paper (S&S 903) by technicians or trained nurses. For babies remaining in hospital for 3 days or more, blood is collected before departure. Quality assessment of laboratory results in the UAE is monitored by the schemes of the United Kingdom National External Quality Assessment Service and the United States Centers for Disease Control and Prevention. Any positive screening results are notified immediately to the central department of the MCH by the laboratory. The district MCH coordinator will be informed and will contact the parents.

For a baby screening positive for amino acid, organic acid and fatty acid oxidation disorders, CH, CAH and biotinidase deficiencies, further blood and urine samples are tested to confirm the diagnosis. For a baby screening positive for SCD or trait, blood is taken from the baby and family members before the age of 2 months for diseased and 4 months for trait cases to confirm the diagnosis and deliver genetic counselling. Testing of the parents for all haemoglobinopathies, including thalassaemia, may help establish the correct diagnosis in some infants.

Laboratory procedures

For screening for PKU (before March 2011), CAH, CH and biotinidase deficiency the Delfia® time-resolved fluorescence application (Wallac Oy) was used to determine levels of phenylalanine (PA), thyroid stimulating hormone (TSH), 17α-hydroxyprogesterone and biotinidase enzyme activity.

For detection of SCD the same filter papers were tested by high-performance liquid chromatography (Variant™, Bio-Rad).

Amino acid, organic acid and fatty acid oxidation disorders were detected by MS/MS (API 3200™, HVD/Perkin Elmer). At the time of the study 12 disorders were included in the screening: PKU, maple syrup disease, citrullinaemia type I, argininosuccinic acidaemia, isovaleric acidaemia, 3-methylcrotonyl-CoA carboxylase deficiency, hydroxymethylglutaric aciduria, beta-ketothiolase deficiency, glutaric acidaemia type I, propionic acidaemia, methylmalonic acidaemia and medium-chain acyl-coenzyme A dehydrogenase deficiency.

Cut-offs

The following cut-offs were used for TSH levels (normal < 10 mU/L, borderline 10–25 mU/L, abnormal > 25 mU/L), PA levels (normal < 3 mg/dL, borderline 3–4 mg/dL, abnormal > 4 mg/dL), 17OHP levels (normal < 30 nmol/L, borderline 30–90 nmol/L, abnormal > 90 nmol/L) and biotinidase levels (normal > 30%, borderline 10%–30%, abnormal < 10%).

Molecular methods

Molecular diagnosis is done for specimens that show putative positive results following initial analysis to determine the presence or absence of specific mutations. This provides critical genetic data to confirm diagnosis and genetic counselling. The tests are done for all neonates, but for this study we selected the results of the UAE national babies to determine the UAE genetic profile and we excluded from our study the genetic

results of the other nationalities due to variable genetic profiles.

For PKU, the 13 exons and their exon-flanking intronic sequence of phenylalanine hydroxylase (PAH) gene were amplified by polymerase chain reaction (PCR) assay, and then single-strand conformation polymorphism analysis for exons of the PAH gene and finally sequencing of gene exons was used to study uncharacterized PKU chromosomes [3]. The CAH confirmatory test was done by CAH strip assay covering 11 mutations in the *CYP21A2* gene by reverse hybridization assay and a quantitative PCR approach to determine gene copy numbers [4]. For biotinidase deficiency, DNA sequence analysis was used to test for the presence of a mutation in all 4 exons of the biotinidase gene [5].

Results

Uptake of screening

Table 1 shows that the percentage uptake (coverage) of neonatal screening in the UAE increased from 50% in 1998 to reach 95% in 2010, with a rapid increase in 2003.

Congenital hypothyroidism

A total of 513 infants who screened positive for CH were further investigated and followed up; these included 129 infants with persistent borderline CH (TSH 10–25 mU/L) and 384 with abnormal results (TSH > 25 mU/L) (Table 2). Of the 129 borderline cases, 16 (12.4%) were confirmed CH, of whom 9 were defaulters. Of the infants with abnormal test results, 357 (92.9%) were confirmed CH. There were 60 transient cases that were normal on follow up. Among the transient cases, there were 14 cases with maternal history of autoimmune thyroid disease, 26 premature cases and 20 cases with unidentified causes. Of the 698 629 babies screened from the start (1 January 1988 to 31 December 2011) 373 were confirmed CH cases, an incidence of CH among the screened neonates of 1:1 873.

Phenylketonuria

Table 3 shows 132 neonates who screened positive for PKU; these were 75 with persistent borderline PKU (phenylalanine 3–4 mg/dL) and 57 abnormal babies (phenylalanine > 4 mg/dL)]. Of the 57 abnormal cases, 51 were confirmed as classic PKU (phenylalanine > 20 mg/dL, normal tyrosine and normal biopterin) and 1 case as PKU due to biopterin defect. Of the borderline cases, 61 (80.1%) were false positives. The incidence of PKU was 1:14 544.

Molecular DNA testing

A total of 7 different mutations (3 splicing mutations and 4 missense mutations) were detected by analysis of the PAH gene for 16 UAE national babies. The frequencies of the mutations were as follows: IVS2+5G>C (37.5%), R261Q (18.8%), IVS10–11G>A (12.5%), IVS9–2A>G (12.5%), R252Q (6.3%), P281L (6.3%) and L48S (6.3%).

Amino acid, organic acid and fatty acid disorders

Table 4 shows that 16 cases of amino acid, organic acid or fatty acid disorders were detected by MS/MS from March 2011 until December 2011. There were 7 cases of hydroxymethylglutaric aciduria, 3 new cases of PKU (detected by MS/MS not by conventional methods) and 2 cases of glutaric acidaemia type I. The total incidence of these disorders was 1:353.

Sickle cell haemoglobinopathies

Table 5 shows that out of 5 498 positive screening results for sickle-cell haemoglobinopathies 231 neonates were SCD (FS), 80 had non-sickle haemoglobinopathy, 4481 were sickle haemoglobinopathy carriers (FAS) and 592 were haemoglobinopathy D carriers (FAD). The data showed that the incidence of SCD was 0.04%. It is noteworthy that 203 out of 231 SCD cases were confirmed as homozygous haemoglobin (Hb)S and only 28 cases were confirmed as sickle/beta-thalassaemia. The incidence of sickle-cell traits were 0.83% (1:121). For the non-sickle haemoglobinopathies, the incidence was 0.11% for HbD trait and 0.02% for HbC trait.

Congenital adrenal hyperplasia

Table 6 shows that out of 42 positive CAH screening results 41 babies were

Table 1 Coverage of the neonatal screening programme in the United Arab Emirates (1998 to 2010)

Year	No. of live births	% screened
1998	45 044	50
1999	49 075	61
2000	52 070	65
2001	53 485	67
2002	57 083	69
2003	60 249	89
2004	63 610	92
2005	66 192	94
2006	66 967	93
2007	67 789	94
2008	68 779	95
2009	76 366	95
2010	79 464	95

Data source: Department of Preventive Medicine, Ministry of Health, United Arab Emirates.

Table 2 Follow up of newborns screening positive for congenital hypothyroidism (January 1998 to December 2011)

Variable	Borderline (TSH 10–25 mU/L)		Abnormal (TSH > 25 mU/L)		Total
	No.	%	No.	%	No.
Confirmed	16[a]	12.4	357	92.9	373
Transient	49	38.0	11	2.9	60
False +ve	57	44.2	9	2.3	66
Failure to recall	7	5.4	7	1.9	14
Total +ve screening	129	100.0	384	100.0	513

[a]9 cases were defaulters aged > 1 month when screened.
TSH = thyroid stimulating hormone.

term deliveries and 1 was a preterm delivery. The data indicated that the number of false positive recalls for preterm deliveries (n = 175) was greater than for the term group (n = 77). The total incidence of classical CAH detected through newborn screening in the UAE was 1:9 030.

Molecular DNA testing

Of the 21 UAE national cases diagnosed as having CAH 18 were confirmed genetically as *CYP21* deficiencies, i.e. a mutation was found on both alleles: 10 were found to be homozygous for *I2* splice mutation; 6 had homozygous *CYP21A2* gene deletion; and 2 were heterozygous *I2* mutation. Three patients carried no *CYP21* mutations by the methods used.

Biotinidase deficiency

Three confirmed cases of biotinidase deficiency by enzymatic testing (1 profound and 2 partial cases) were discovered during the pilot study for 25 000 UAE national babies in 2010, an incidence of 1:8 300.

Molecular DNA testing

Molecular testing was done for only 2 confirmed cases. The first patient had partial biotinidase deficiency and 2 heterozygous point mutations were detected [*C186Y* (Cys186Tyr) and *D444H* (Asp444His)]. The second patient had profound biotinidase deficiency and 4 mutations were detected [2 homozygous mutations *F403V* (Phe403Val) and 2 homozygous mutations *D444H* (Asp444His)].

Discussion

Over the past 4 decades, many countries have developed screening programmes for newborns. An effective neonatal screening programme requires careful planning including education, administration, laboratory analysis, follow-up, management, evaluation and, most importantly, the commitment of all involved [6].

Our data indicated that the percentage uptake of neonatal screening in the UAE increased from 50% in 1998 to reach 95% in 2010, with a rapid increase in 2003, although to levels still below the international coverage standard (99%) [7]. This improvement could be due to increased community awareness, a better recall system for defaulters, perinatal health education being combined with a breastfeeding programme and the recording of the screening status of the baby on the child welfare record along with vaccination information. The rapid increase in the rate of uptake in 2003 can be attributed to starting cooperation with Dubai medical district.

The incidence of CH among the screened neonates was 1:1 873. Of 373 confirmed cases, 357 had abnormal TSH level and 16 had persistent borderline TSH. Although high by international standards, the incidence of CH in the UAE was similar to that of other

Table 3 Follow up of newborns screening positive for phenylketonuria (PKU) (January 1995 to December 2011)

Variable	Borderline (PHA 3–4 mg/dL)		Abnormal (PHA > 4 mg/dL)		Total
	No.	%	No.	%	No.
PKU	–	0.0	52	91.2	52[a]
Benign hyperplasia	11	15.1	5	8.8	16
Transient	3	4.8	–	0.0	3
False +ve	61	80.1	–	0.0	61
Total +ve screening	75	100.0	57	100.0	132

[a]51 cases were diagnosed as classical PKU and 1 case as PKU due to biopterin deficiency.
PHA = phenylalanine.

Table 4 Amino acid, organic acid and fatty acid disorders in newborns screened by tandem mass spectrometry (March 2011 to December 2011) (*n* = 56 416)

Type	No. of cases
Phenylketonuria	3
Maple syrup disease	1
Hydroxymethylglutaric aciduria	7
Glutaric acidaemia type I	2
Medium-chain acyl-coenzyme A dehydrogenase deficiency	1
Methylmalonic acidaemia	1
Isovaleric acidaemia	1
Total	16

countries in the region such as Oman (1:2 200) and Saudi Arabia (1:2 666) [8].

In our research, which used TSH as an indicator for the evaluation of iodine deficiency, the high incidence of CH was unlikely to be explained through iodine deficiency mechanisms [9]. Of the 513 cases that screened positive, 60 transient cases were normal on follow up. This was explained by maternal history and investigations of autoimmune thyroid diseases in 14 cases and the presence of prematurity in 26 cases. However, in 20 cases no specific cause was found. This deserves further investigation, e.g. obtaining an accurate clinical history of perinatal exposure to iodine, maternal antithyroid medication intake during pregnancy, TSH receptor antibodies and thyroid peroxidase antibodies. These measures should help to decrease the recall rate when screening for CH and thus eliminate unnecessary stress to families, while contributing to a decline in the relatively high incidence of CH in the UAE [10].

There were 52 confirmed PKU cases over the 17-year period of screening (a relative incidence of 1:14 544); 51 were confirmed as classic PKU (phenylalanine > 20 mg/dL, normal tyrosine and normal biopterin) and 1 case as PKU due to biopterin defect. The incidence of PKU in the UAE was similar to that of other Gulf countries [11]. The high incidence of false positives within the borderline group might be due to genetic heterogeneity of hyperphenylalaninaemia and might indicate a need to adjust the cut-off point for the screening test [12].

A total of 7 different mutations with no novel ones were detected by analysis of the PAH gene for 16 UAE national cases. Three splicing mutations were identified, with the following frequencies [IVS2+5G>C (37.5%), IVS10–11G>A (12.5%) and IVS9–2A>G (12.5%)] and all were in the homozygous state. Four missense mutations were identified, with the following frequencies [R261Q (18.8%), R252Q (6.3%), P281L (6.3%) and L48S (6.3%)]. R261Q and R252Q were in the homozygous state but P281L and L48S were in the compound heterozygous state. The different mutations also contribute to a difference in phenotype and response to pharmacological doses of tetrahydrobiopterin [13].

There were 16 cases of amino acid, organic acid and fatty acid disorders detected by MS/MS over a 10-month period in 2011 (*n* = 56 416 neonates screed), an incidence 1:3 526. The majority (7 cases) were hydroxymethylglutaric aciduria.

The figures for SCD (0.04%) and sickle-cell trait (0.83%) were lower than earlier studies done in the UAE, which recorded an incidence of 1.9% for sickle-cell trait [14]. A study in Saudi Arabia reported an incidence range of 2%–27% for sickle-cell trait and about 1.4% for SCD with the highest rates in the Eastern region

Table 5 Prevalence of confirmed sickle-cell diseases, non-sickle haemoglobinopathies and haemoglobinopathy carriers among newborns (January 2002 to December 2011) (*n* = 542 286)

Type	Diseased			Carriers		
	No. identified	Incidence	Prevalence (%)	No. identified	Incidence	Prevalence (%)
Sickle Hb	231[a]	1:238	0.04	4481	1:121	0.83
Non-sickle Hb	80	–	–	–	–	–
HbC	11	–	–	69	–	0.02
HbD	65	–	0.01	592	–	0.11
HbE	4	–	–	19	–	–
Unidentified band	–	–	–	11[b]		–
Fetal Hb	–	–	–	15[c]	–	–

[a]Sickle-cell diseases: included 203 cases confirmed as homozygous SS and 28 cases confirmed as sickle/beta-thalassaemia; [b]3 diagnosed as HbO Arab by family study; [c]β-thalassaemia and hereditary persistence of fetal haemoglobin.
Hb = haemoglobin.

Table 6 Follow up of newborns screening positive for congenital adrenal hyperplasia (CAH) from January 2007 to December 2011

Variable	Term	Preterm	Total
Screened population (no.)	367 436	11 836	379 272
Recalls (no.)	717	337	1 054
Recall rate (%)	0.2	2.9	0.28
CAH confirmed (no.)	41	1	42
False positive recalls (no.)	77	175	252

and the lowest in the Central region of the country [15]. Bahrain, on the other hand, had a rate of 11%–18% for sickle-cell trait, and an incidence of SCD of 2.1% among screened newborns [16]. Oman has reported an incidence of 10% for sickle-cell trait and about 0.4% for SCD [17].

The total incidence of classical CAH detected through newborn screening over a 10-year period in the UAE was 1:9 030. This figure is in agreement with older data from UAE derived from clinically detected cases [Azzam A, unpublished data, 2000] and with the high incidence of CAH reported in Saudi Arabia [18]. The high incidence of CAH in UAE and Saudi Arabia can be explained by the high rate of consanguineous marriages. The considerable false-positive recall rate for neonatal 17α-hydroxyprogesterone screening causes a substantial economical burden and emotional stress for parents and makes genetic testing an important confirmatory tool for early and reliable CAH diagnosis. More than 90% of classical CAH are caused by mutations in or deletions of the *CYP21A2* gene encoding steroid 21-hydroxylase [19]. Eighteen of 21 local cases diagnosed as having CAH were confirmed genetically as *CYP21* deficiencies with 10 being homozygous for *I2* splice mutation and 6 homozygous *CYP21A2* gene deletion. Two cases had heterozygous *I2* mutation and, as the 2 cases were confirmed biochemically, we propose that these cases may be attributable to compound heterozygosity of the *CYP21* gene with a rare or *de novo* mutation. Three patients carried no *CYP21* mutations by the method used and can also be attributable to other causes.

Three confirmed biotinidase deficiency cases by enzymatic testing (1 as profound and 2 as partial cases) were discovered during the pilot study for 25 000 UAE national babies in 2010, an incidence of 1:8 300. The disease incidence varies between countries, with higher incidences in countries with a high degree of consanguinity, such as Turkey, Saudi Arabia and Qatar (e.g. 1 in 12 607 screened babies in Qatar) [20]. The estimated international incidence of combined partial and profound biotinidase deficiency is 60 089 newborns (1:49 500 to 1:73 100) [21]. The first patient had partial biotinidase deficiency as confirmed by enzymatic and molecular testing. The molecular testing revealed 2 heterozygous mutations: *C186Y* mutations associated with profound biotinidase deficiency and *D444H* mutations associated with partial biotinidase deficiency. The presence of these heterozygous mutations in the biotinidase gene were consistent with a diagnosis of partial biotinidase deficiency. The second patient had profound biotinidase deficiency as confirmed by enzymatic and molecular testing. The molecular testing revealed 4 mutations: 2 homozygous *F403V* pathogenic mutations and 2 homozygous *D444H* mutations consistent with partial biotinidase deficiency. The presence of 2 double homozygous mutations in the biotinidase gene was consistent with a diagnosis of profound biotinidase deficiency. No previous reports of similar cases were found in literature for the patient having 2 homozygous alterations (*F403V*; *D444H*). These alterations could be considered as novel mutations and could be related to a deletion of the exon, parental consanguinity, uniparental disomy or by chance alone. One way to address this issue is to test the parents and determine if they are carriers of the above mentioned alterations [22].

Conclusions

Based on the statistical data of the incidence of screened diseases in the UAE and the success achieved in early detection, treatment and follow-up, we emphasize the importance of expanding the programme capacity.

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Prevalence and factors associated with exclusive breastfeeding at 6 months of life in Tehran: a population-based study

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معدل الانتشار والعوامل المصاحبة للاقتصار على الإرضاع من الثدي حتى الشهر السادس من العمر في طهران: دراسة ترتكز على السكان

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الخلاصة: يعتبر الاقتصار على الإرضاع من الثدي أفضل شكل من أشكال تغذية الرضع خلال الأشهر الستة الأولى من حياتهم. وتهدف هذه الدراسة إلى التعرف على معدل انتشار الاقتصار على الرضاعة من الثدي في طهران، جمهورية إيران الإسلامية، خلال الأشهر الستة الأولى من الحياة، وعلى العوامل التي تؤثر عليه. وهي دراسة مستعرضة ترتكز على السكان شملت 538 أماً استكملن بيانات المقابلة، تتراوح أعمار أطفالهن بين 6-24 شهراً. واتضح أن 46.5٪ منهن فقط قد اقتصرن على إرضاع أطفالهن من الثدي خلال الأشهر الستة الأولى من حياتهم. كما أظهر التحليل المتعدد المتغيرات أن التكميل بالمستحضرات في المستشفى (نسبة الأرجحية 0.41، وفترة الثقة 95٪، وبقيم تتراوح 0.17-0.95)، وتلقّي الأمهات لنصائح متضاربة حول إرضاع الأطفال (نسبة الأرجحية 0.53، وفترة الثقة 95٪ وبقيم تتراوح 0.37-0.78) كان لها تأثيرات سلبية على الاقتصار على الإرضاع. وقد كان لكلٍّ من عَزْم الأمهات على الاقتصار على الإرضاع من الثدي (نسبة الأرجحية 5.85، وفترة الثقة 95٪ وبقيم تتراوح بين 2.88 و11.9)، والتماسّ الأول مع الرضيع خلال 6-30 دقيقة بعد ولادته (نسبة الأرجحية 2.35، وفترة الثقة 95٪، وبقيم تتراوح بين 1.17 و4.72) تأثيرات إيجابية على الاقتصار على الإرضاع من الثدي.

ABSTRACT Exclusive breastfeeding is the best form of nutrition for infants in the first 6 months of life. The aim of this study was to determine the prevalence of exclusive breastfeeding in Tehran, Islamic Republic of Iran in the first 6 months of life, and the factors that influence it. In a population-based, cross-sectional study 538 mothers with children aged 6–24 months completed an interview questionnaire. Only 46.5% of mothers exclusively breastfed their infant in the first 6 months of life. In multivariate analysis formula supplementation in the hospital (OR = 0.41, 95% CI: 0.17–0.95) and mother receiving conflicting infant feeding advice (OR = 0.53, 95% CI: 0.37–0.78) had a negative effect on exclusive breastfeeding. Mother's intention to exclusively breastfeed (OR = 5.85, 95% CI: 2.88–11.9) and infant having first breast contact 6–30 minutes after delivery (OR = 2.35, 95% CI: 1.17–4.72) had positive effects on exclusive breastfeeding.

Prévalence et facteurs associés à l'allaitement maternel exclusif à six mois de vie à Téhéran : une étude en population générale

RÉSUMÉ L'allaitement maternel exclusif est la meilleure forme d'alimentation pour les nourrissons dans les six premiers mois de vie. La présente étude visait à déterminer la prévalence de l'allaitement maternel exclusif à Téhéran (République islamique d'Iran) dans les six premiers mois de vie et ses facteurs d'influence. Au cours d'une étude transversale en population, 538 mères d'enfants âgés de 6 à 24 mois ont rempli un questionnaire en entretien. Seules 46,5 % des mères avaient allaité exclusivement leur nourrisson dans les six premiers mois de vie. D'après une analyse multivariée, le lait en poudre à l'hôpital (O.R. = 0,41 ; IC à 95 % : 0,17–0,95) et des conseils d'alimentation contradictoires prodigués à la mère (O.R. = 0,53 ; IC à 95 % : 0,37–0,78) avaient des effets négatifs sur l'allaitement maternel exclusif. En revanche, l'intention de la mère d'allaiter exclusivement (O.R. = 5,85 ; IC à 95 % : 2,88–11,9) et une première mise au sein entre 6 et 30 minutes après l'accouchement (O.R. = 2,35 ; IC à 95 % : 1,17–4,72) avaient des effets positifs sur l'allaitement maternel exclusif.

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Introduction

Exclusive breastfeeding is the best form of nutrition for infants in the first 6 months of life as breast milk protects the child against respiratory infections, diarrhoea, asthma and allergy [1]. It also appears to decrease the risk of sudden infant death syndrome, atopic diseases, lymphoma, mortality and morbidity from infectious diseases [2,3]. Several studies have shown the effect of breastfeeding on protection against obesity, type 2 diabetes, acute leukaemia and colic [1–3]. Exclusive breastfeeding in the first 6 months of life has other advantages such as helping mothers bond with their infants, playing an important role in the health of the mother by decreasing postpartum haemorrhage and the risk of premenopausal breast cancer, ovarian cancer and osteoporosis; lactating woman have an earlier return to pre-pregnant weight [1]. In addition, exclusive breastfeeding provides significant social and economic benefits to the nation including reduced health-care costs and reduced employee absenteeism for care attributable to child illness [3].

In the Islamic Republic of Iran, the percentage of infants exclusively breastfed in the first 6 months of life has been reported as anywhere between 13% and 77% in different studies in various parts of the country [4–8]. Numerous factors have been associated with exclusive breastfeeding, and being aware of these influences can inform interventions on encouraging exclusive breastfeeding, which is of vital importance for mothers, clinicians and society in general. The decision to begin and continue exclusive breastfeeding can be influenced by factors such as maternal age and self-confidence, infant diseases, gestational age, birth weight, maternal education level, father's occupation, type of delivery, whether the infant is meeting growth milestones or not and the mother's awareness of the sufficiency of her breast milk [4–8].

To the best of our knowledge, no previous studies have been conducted in Tehran about the determinants of exclusive breastfeeding. The aim of this population-based study was to determine the prevalence of exclusive breastfeeding in the first 6 months of life and the influencing factors (sociodemographic, childbirth and postpartum) with a focus on postpartum factors.

Methods

Study design and sample

This was a cross-sectional study conducted in Tehran, the capital city of Islamic Republic of Iran. In a previous study, the prevalence of exclusive breastfeeding for infants at 6 months of age in Tehran was found to be 35% [4]. The sample size was determined assuming 95% confidence interval (CI) and 80% power of test. Based on this, 547 mothers were interviewed and the data from 538 mothers were analysed (98.4% response rate).

The subjects were mothers with infants aged 6–24 months living in Tehran. Sampling began in the most densely populated part of each of the 22 districts in Tehran according to the population map of Tehran. We visited every house in the area, and women meeting the criteria for our study and willing to participate were recruited using a multistage, random cluster technique. Data gathering was conducted in June and July 2011. The questionnaire was completed by a face-to-face interview. The inclusion criteria were having an infant aged 6–24 months, a singleton baby, living in Tehran during the previous year and Iranian nationality.

Participation in the study was voluntary and written consent was obtained from all the mothers prior to their participation. Tehran University of Medical Sciences granted ethical approval for the study.

Data collection

In this study, the variables collected were: parental sociodemographic factors (mother's age, education level, ethnicity, employment, work status before delivery, marital status, parity and use of cigarettes; father's age, education level, employment and ethnicity; household income and area of residence); childbirth factors (mode of delivery, infant's sex, birth weight, gestational age and birth health); and postpartum factors (infant admitted to the neonatal care unit, when infant was put to the breast, skin-to-skin contact, infant being demand fed, mother's intention to breastfeed before childbirth, health problems within 6 months of delivery, clinician assistance with breastfeeding, clinician counselling on exclusive breastfeeding, formula supplementation at hospital after birth, husband's support for exclusive breastfeeding, family and friends' support for exclusive breastfeeding, mother receiving conflicting infant feeding advice, pacifier use during the first week of life, mother having enough time for exclusive breastfeeding, mother's breastfeeding history and postnatal depression).

All information was gathered via a questionnaire and interview with the mother. Exclusive breastfeeding was defined according to the World Health Organization definition [2]. The information regarding postnatal depression was obtained using the Edinburgh Depression Scale. This scale has 10 items scored from 0–3 and the mother was asked to base her answers on the previous 7 days. A total score of ≥ 12 indicated postnatal depression. Since depression symptoms may exist for up to 24 months postpartum, the mothers were classified into 2 groups: depressed and non-depressed.

Data analysis

The dependent variable in this study was exclusive breastfeeding in the first 6 months of life. Independent variables

associated with exclusive breastfeeding were compared separately using a chi-squared test. If these variables were significant, they were entered into a multivariable logistic regression analysis. *P*-values < 0.05 were considered as statistically significant and the data were analysed by *SPSS*, version 18.0.

Results

Background variables

The mean age of participating children was 13.8 (SD 5.4) months; 50.9% were girls and 49.1% were boys. The mean birth weight of the study children was 3485 (SD 424) g; 90.3% of infants had a normal birth weight (2500–4000 g). Of the infants 74.7% were born at term (37 weeks gestation or more). More than half of infants (60.2%) were born by caesarean section and 39.8% were born via normal vaginal delivery. Although 47 infants (8.7%) had health problems at birth, 91.3% of infants were born healthy.

Around one-quarter of mothers (131, 24.3%) reported that their household income was insufficient to meet the needs of the family. In addition, 67.5% of mothers were aged 25–30 years. Only 75 mothers (13.9%) were working before the birth of their child. More than half of the parents had diploma level education or above. Nearly all mothers (99.8%) were married and only 1 was divorced; thus we did not analyse marital status as a factor. No mothers smoked during pregnancy, although 4 mothers (0.7%) smoked during breastfeeding. Due to the small number of cigarette-smoking mothers, we did not analyse this factor. Postnatal depression was diagnosed in 102 mothers (19.0%) according to the Edinburgh Depression Scale.

Prevalence of exclusive breastfeeding

The prevalence of exclusive breastfeeding of infants at birth, as reported by the mothers, was 95.0%. Of the mothers 43.5% put the child to the breast in the first half hour of life, but 5 mothers had never put their infant to their breast. During the first week after birth, 361 mothers breastfed on demand, 105 breastfed according to a fixed programme and the others fed with a combination of these methods. Seventy-three mothers used a pacifier during the infant's first week of life.

Figure 1 shows that the reported prevalence of exclusive breastfeeding declined steadily over the 6 months after birth. At 6 months only 46.5% of mothers were exclusively breastfeeding their infants. A few mothers (4.6%) used formula milk and 25.5% used something other than formula (e.g. mixing rice with milk and sugar, tea, sweetened water and juice) (Table 1). The mean duration of exclusive breastfeeding was 4.4 (SD 1.9) months. Only 7.4% of mothers were still breastfeeding their infant at 23–24 months.

When asked about their intentions before the birth 86.4% of mothers said they had intended to breastfeed exclusively and 4.1% had intended to use formula prior to childbirth. Of the mothers 83.6% had the support of their husband and relatives with regard to exclusive breastfeeding and 60% did not have any breastfeeding history.

Bivariate analysis

Using a chi-squared test with 95% CI, no relationship was found between exclusive breastfeeding and sociodemographic factors or childbirth factors (Tables 2 and 3). Some postpartum factors were significantly associated with exclusive breastfeeding including the time of first skin-to-skin contact ($P = 0.014$), the time of the first breastfeed ($P = 0.005$), mother's intention to breastfeed before childbirth ($P < 0.001$), formula supplementation in hospital after birth ($P = 0.046$), husband's support for exclusive breastfeeding ($P = 0.021$),

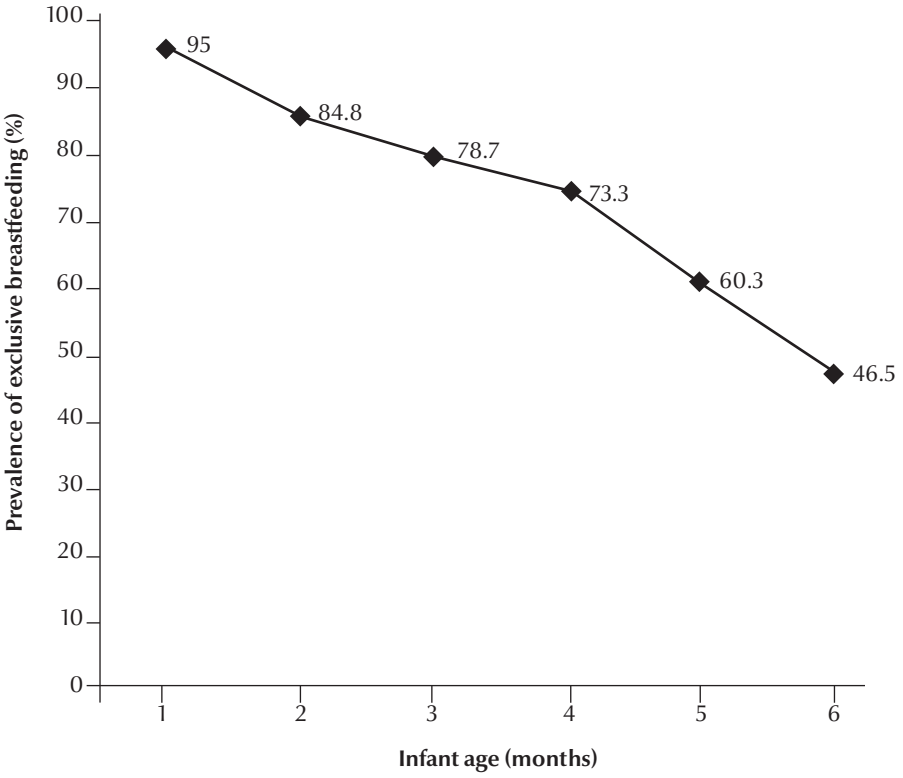

Figure 1 Rates of exclusive breastfeeding during the first 6 months of infant's life (*n* = 538 mothers)

Table 1 Frequency of feeding methods in the first 6 months of infant's life

Feeding	No. of mothers	%
Formula	25	4.6
Exclusive breastfeeding	250	46.5
Combination of formula and breastfeeding	126	23.4
Other	137	25.5
Total	538	100.0

having enough time for exclusive breastfeeding (P = 0.001), mother receiving conflicting infant feeding advice in the first 6 months (P < 0.001), family support for exclusive breastfeeding (P = 0.016) and pacifier use during the first week of life (P = 0.035). These variables were included in the final model.

Multivariable logistic regression analysis

In the multivariable logistic regression analysis, the following factors were left in the model: mother's intention to breastfeed before childbirth, timing of the first breastfeeding, mother receiving conflicting infant feeding advice and formula supplementation at hospital after birth.

When the first breastfeeding was 6–30 minutes after childbirth, it had a positive effect on exclusive breastfeeding in the first 6 months of life (OR = 2.35, 95% CI: 1.17–4.72) (Table 4). A delay in the first breastfeeding decreased the chances of successful exclusive breastfeeding in the first 6 months. Mothers who intended to exclusively breastfeed before childbirth were 6 times more likely to exclusively breastfeed than mothers who did not intend to exclusively breastfeed before childbirth (OR = 5.85, 95% CI: 2.88–11.9).

Formula supplementation in the hospital and mothers receiving conflicting infant feeding advice had a negative effect on the duration of exclusive breastfeeding in the first 6 months of life (OR = 0.41, 95% CI: 0.17–0.95 and OR = 0.53, 95% CI: 0.37–0.78 respectively).

Discussion

Exclusive breastfeeding in the first 6 months of life has been shown to be one of the main factors that can reduce infant mortality [2]. In our study, the prevalence of exclusive breastfeeding in Tehran clearly decreased, from 95.0% at birth to 46.5% at age 6 months. This rate of exclusive breastfeeding at the 6-month mark was higher than that found in previous studies in some other cities in the Islamic Republic of Iran, such as Yazd and Kashan, but lower than in Mashhad [4–8]. Due to the lack of data in Tehran, a comparison was not possible. In studies conducted in other countries, the number of infants who were exclusively breastfed at 6 months of age ranged from 1%–43%; thus our study has shown that the prevalence of exclusive breastfeeding in Tehran was higher than some countries [9–12]. It is obvious that differences in culture, study design and study population and number of subjects in these studies may have contributed to these differences.

Our study found that if the first infant breastfeeding occurred during the 6–30 minutes after childbirth this had a positive effect on exclusive breastfeeding at 6 months of life (OR = 2.35, 95% CI: 1.17–4.72). This result is in line with the findings of Eslami et al. [8] and Rowe-Murray and Fisher [13] but disagrees with Nakao et al. [14]. Early breastfeeding is one of the factors contributing to the success of exclusive breastfeeding [1,15]. The timing of first breastfeeding is crucial and when it occurs before the first 30 minutes after childbirth, the chances of a mother being able to exclusively breastfeed for the first 6 months of her infant's life are improved [13]. The aim of beginning breastfeeding may be different. The aim is sometimes to have a successful and complete breastfeeding or sometimes, like the present study, only a short breastfeeding. Therefore, this difference may be due to differences in classifying the time of breastfeeding in the data analysis.

In this study, mothers who received conflicting infant feeding advice in their infant's first 6 months of life were less likely to exclusively breastfeed for up to 6 months (OR = 0.53, 95% CI: 0.37–0.78). In other studies [16,17], mothers who were supported after childbirth had their first breastfeed earlier than mothers who were not supported, and were more likely to exclusively breastfeed when the husband and family supported exclusive breastfeeding [17,18]. On the other hand, many behaviours are influenced by social customs, which are influenced by a person's beliefs and often the wishes of other family members. In the Islamic Republic of Iran and some Asian countries, a woman's family members and husband may strongly influence a mother's decisions.

Mothers who received formula supplementation in hospital after childbirth were less likely to exclusively breastfeed their infant in the first 6 months of life (OR = 0.41, 95% CI: 0.17–0.95). This is consistent with some previous studies [19,20]. The reason for mothers failing to exclusively breastfeed in their infant's first 6 months of life can be a lack of support for exclusive breastfeeding [20] and receiving formula supplementation at hospital or receiving other support on formula that led to lack of self-confidence about exclusive breastfeeding.

In this study, we found that a mother's intention to breastfeed before childbirth was associated with exclusive breastfeeding in the first 6 months of life (OR = 5.85, 95% CI: 2.88–11.9) and this finding confirms the findings of other studies [20–22]. Mothers

Table 2 Distribution of infants exclusively breastfed, by parental sociodemographic variables

Variable	No. of mothers	Exclusive breastfeeding		χ^2 (df)	*P*-value
		Yes %	No %		
Maternal variables					
Mother's age (years)				0.149 (2)	0.928
≤ 25	155	47.7	52.3		
26–30	208	46.2	53.8		
≥ 30	175	45.7	54.3		
Mother's education level				5.108 (3)	0.164
Illiterate/elementary	41	39.0	61.0		
Secondary/high school	96	53.1	46.9		
High school diploma	260	48.5	51.5		
University	141	40.4	59.6		
Mother's employment				0.924 (1)	0.336
Employed	75	41.3	58.7		
Unemployed	463	47.3	52.7		
Mother's ethnicity				0.785 (2)	0.675
Persian	297	45.5	54.5		
Azari	144	45.8	54.2		
Other	97	50.5	49.5		
Mother's return to work after delivery (months)[a]				2.723 (1)	0.256
< 6	23	47.8	52.2		
≤ 6	52	38.4	61.6		
Parity				1.174 (2)	0.556
1	299	44.5	53.5		
2	190	48.3	51.7		
≥ 3	49	51.0	49.0		
Paternal variables					
Father's age (years)				1.004 (2)	0.605
≥ 29	121	43.8	56.2		
30–35	245	45.7	54.3		
≥ 36	172	49.4	50.6		
Father's education level				5.858 (3)	0.119
Illiterate/ elementary	50	48.0	52.0		
Secondary/ high school	104	56.7	43.3		
High school diploma	237	43.9	56.1		
University	147	42.9	57.1		
Father's employment				0.722 (2)	0.697
Unemployed	19	42.1	57.9		
Government	176	44.3	55.7		
Non-government	343	47.8	52.2		
Father's ethnicity				2.745 (2)	0.253
Persian	285	48.8	51.2		
Azari	143	40.6	59.4		
Other	110	48.2	51.8		

Table 2 Distribution of infants exclusively breastfed, by parental sociodemographic variables (*concluded*)

Variable	No. of mothers	Exclusive breastfeeding		χ^2 (df)	*P*-value
		Yes	No		
		%	%		
Household variables					
Household income				0.186 (2)	0.911
Sufficient	131	48.1	51.9		
Relatively sufficient	353	45.9	54.1		
Insufficient	54	46.3	53.7		
Area of residence				8.691 (4)	0.069
North	51	43.1	56.9		
South	162	49.1	50.9		
East	163	52.4	47.6		
West	113	42.5	57.5		
City centre	49	30.6	69.4		

[a]*n = 75.*
df = degrees of freedom.

Table 3 Distribution of infants exclusively breastfed, by childbirth and postpartum variables

Variable	No. of mothers	Exclusive breastfeeding		χ^2 (df)	*P*-value
		Yes	No		
		%	%		
Childbirth variables					
Mode of delivery				0.204 (1)	0.651
Vaginal	214	47.7	52.3		
Caesarean	324	45.7	54.3		
Infant's sex				0.559 (1)	0.254
Male	264	48.1	51.9		
Female	274	44.9	55.1		
Infant's birth weight (g)				3.269 (2)	0.195
≤ 2500	34	35.3	64.7		
2500–4000	486	46.7	53.3		
≥ 4000	18	61.1	38.9		
Infant's birth age (week)				0.026 (1)	0.873
< 37	136	47.1	52.9		
≥ 37	402	46.3	53.7		
Infant's birth health				2.196 (1)	0.091
Healthy	491	47.5	52.5		
Unhealthy	47	36.2	63.8		
Postpartum variables					
Health problem in the 6 months after delivery				0.053 (1)	0.818
Yes	177	45.8	54.2		
No	361	46.8	53.2		
Postnatal depression				0.019 (1)	0.892
Yes	83	45.8	54.2		
No	455	46.6	53.4		

Table 3 Distribution of infants exclusively breastfed, by childbirth and postpartum variables (*continued*)

Variable	No. of mothers	Exclusive breastfeeding		χ^2 (df)	*P*-value
		Yes %	No %		
Postpartum variables					
Infant admitted to neonatal care unit				0.008 (1)	0.930
Yes	102	46.1	53.9		
No	436	46.6	53.4		
Infant put to the breast (time after birth)				14.71 (4)	0.005
0–5 min	115	57.4	42.6		
6–30 min	119	52.9	47.1		
30 min–2 h	200	42.0	58.0		
2–12 h	59	32.2	67.8		
> 12 h	45	40.0	60.0		
Skin-to-skin contact				12.56 (4)	0.014
0–5 min	124	48.4	51.6		
6–30 min	124	58.1	41.9		
30 min–2 h	107	45.8	54.2		
2–6 h	143	37.8	62.2		
> 6 h	40	37.5	62.5		
Infant breastfed on demand				6.00 (2)	0.050
Yes	361	44.0	56.0		
No	105	57.1	42.9		
Occasionally	72	43.1	56.9		
Mother's intention to breastfeed before childbirth				36.46 (1)	< 0.001
Exclusive breastfeeding	465	51.6	48.4		
Non-exclusive breastfeeding	73	13.7	86.3		
Clinician help with breastfeeding				2.238 (1)	0.134
Yes	348	48.9	51.1		
No	190	42.1	57.9		
Clinician counselling on exclusive breastfeeding				0.007 (1)	0.936
Yes	399	46.4	53.6		
No	139	46.8	53.2		
Formula supplementation in hospital after birth				3.464 (1)	0.046
Yes	30	30.0	70.0		
No	508	47.4	52.6		
Husband's support of exclusive breastfeeding				5.344 (1)	0.021
Yes	450	48.7	51.3		
No	88	35.2	64.8		
Family and friends' support of exclusive breastfeeding				3.741 (1)	0.035
Yes	468	48.1	51.9		
No	70	35.7	64.3		
Mother received conflicting infant feeding advice				12.91 (1)	< 0.001
Yes	216	37.0	63.0		
No	322	52.8	47.2		

Table 3 Distribution of infants exclusively breastfed, by childbirth and postpartum variables (*concluded*)

Variable	No. of mothers	Exclusive breastfeeding		χ^2 (df)	*P*-value
		Yes	No		
		%	%		
Postpartum variables					
Pacifier use during the first week of life				5.072 (1)	0.024
Yes	73	34.2	57.8		
No	465	48.4	51.6		
Having enough time for exclusive breastfeeding				10.89 (1)	0.001
Yes	475	49.1	50.9		
No	63	27.0	73.0		
Mother's breastfeeding history				2.040 (1)	0.090
Yes	215	50.2	49.8		
No	323	44.0	56.0		

df = degrees of freedom.

Table 4 Backward logistic regression model for the associated factors and exclusive breastfeeding of infants at 6 months

Variable	Adjusted OR (95% CI)
Infant put to the breast (time after birth)	
0–5 min	1.76 (0.74–4.24)
6–30 min	2.35 (1.17–4.72)
30 min to 2 h	1.89 (0.95–3.78)
2–12 h	1.37 (0.71–2.63)
> 12 h	1
Mother's intention to breastfeed before childbirth	
Exclusive breastfeeding	5.85 (2.88–11.9)
Non-exclusive breastfeeding	1
Formula supplementation at hospital after birth	
Yes	0.41 (0.18–0.96)
No	1
Mother receiving conflicting infant feeding advice	
Yes	0.53 (0.37–0.78)
No	1

OR = odds ratio; CI = confidence interval.

intending to breastfeed before childbirth are more able to deal with any breastfeeding problems that may arise. The relationship between a mother's intention to breastfeed and exclusive breastfeeding supports the Theory of Reasoned Action. According to one part of this theory, most actions are voluntary and a person's intention to do an action is a necessary factor for doing it and the intention to undertake special behaviour is influenced by that person's attitudes and thoughts and other people's attitudes towards that behaviour [23]. In exclusive breastfeeding, only having information and a positive attitude are not sufficient, as the intention to breastfeed is also needed for success with exclusive breastfeeding [24].

The present study was cross-sectional and the relationship between associated factors and exclusive breastfeeding in the first 6 months of life were not causally related. Moreover, possible recall bias could be another limitation. Nevertheless, the results of this study regarding the prevalence of exclusive breastfeeding in the first 6 months of life and the associated factors may make a useful contribution to the development of efficient interventions for the promotion of breastfeeding.

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Prevalence of anaemia in preschool children in Karma Albalad area, Northern State, Sudan

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معدَّل انتشار فقر الدم لدى الأطفال قبل سن المدرسة في منطقة كرمة البلد في الولاية الشمالية في السودان.

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الخلاصة: يُعتبر فقر الدم من المشاكل الصحية الأساسية في مرحلة الطفولة في البلدان النامية. ولقد كان الهدف من هذه الدراسة المستعرضة تحديد معدل انتشار فقر الدم، وبعض محدداته لدى الأطفال في سن ما قبل المدرسة في قرية ريفية في الولاية الشمالية بالسودان. وتم إدراج جميع الأطفال ممن كانت تتراوح أعمارهم بين سن الثالثة والسادسة عند إجراء البحث في مدارس رياض الأطفال الأربعة في الدراسة. وتم تجميع البيانات الديموغرافية والاجتماعية والاقتصادية باستخدام الاستبيان الذي قام الآباء باستكماله، كما تم أخذ عينات الدم بهدف قياس الهيموغلوبين. ووجد أن 131 من بين 163 طفلاً لديهم فقر دم (أي أن مستوى الهيموغلوبين أقل من 11 غرام لكل دسي لتر) بمعدل انتشار 80.4٪. ويمكن مقارنة هذا الرقم بالبيانات المأخوذة من سائر البلدان النامية. ووجد أن معدّل انتشار فقر الدم لا يرتبط ارتباطاً يعتد به إحصائياً بأي من العوامل الديموغرافية والاجتماعية والاقتصادية التي تمت دراستها (الجنس، الحالة الاقتصادية للأسرة، إلمام الأم بالقراءة والكتابة، أو حجم الأسرة) أو صحة الطفل (سوابق تناول الطفل لمواد غريبة أو عدد مرات الاصابة بالملاريا في العام الماضي). ويتجلى أن هنالك حاجة ماسة إلى إجراء حملة للتعاطي مع هذه المشكلة الصحية الخطيرة على وجه السرعة.

ABSTRACT Anaemia is a major childhood health problem in developing countries. The aim of this cross-sectional study was to determine the prevalence of anaemia, and some of its determinants, in preschool children in a rural village in the Northern State of Sudan. All children aged 3–6 years attending the 4 village kindergartens on the day of the study were enrolled. Demographic and socioeconomic data were collected using a questionnaire completed by parents, and blood samples were taken for haemoglobin measurement. Out of 163 children, 131 had anaemia (haemoglobin level < 11 g/dL), a prevalence of 80.4%. This figure is comparable to data from other developing countries. The prevalence of anaemia was not significantly associated with any of the studied demographic and socioeconomic factors (sex, economic status of the family, mother's literacy or family size) or health of the child (history of pica or number of attacks of malaria in the last year). A campaign to tackle this serious health issue is urgently needed.

Prévalence de l'anémie chez des enfants d'âge préscolaire dans la région de Karma Albalad dans l'État du Nord au Soudan

RÉSUMÉ L'anémie chez l'enfant est une préoccupation de santé publique majeure dans les pays en développement. L'objectif de la présente étude transversale était de déterminer la prévalence de l'anémie ainsi que certains de ses déterminants chez des enfants d'âge préscolaire dans un village rural de l'État du Nord du Soudan. Tous les enfants âgés de trois à six ans fréquentant les quatre écoles maternelles du village le jour de l'étude ont participé. Les données démographiques et socioéconomiques ont été recueillies à l'aide d'un questionnaire rempli par les parents, et des échantillons de sang ont été prélevés pour le dosage du taux d'hémoglobine. Sur 163 enfants, 131 souffraient d'anémie (taux d'hémoglobine < 11 g/dl), une prévalence de 80,4 %. Ce chiffre est comparable aux données d'autres pays en développement. La prévalence de l'anémie n'était significativement associée à aucun des facteurs démographiques et socioéconomiques étudiés (sexe, statut socioéconomique de la famille, degré d'alphabétisme de la mère ou taille de la famille) ni à la santé de l'enfant (antécédents de syndrome de pica ou nombre d'épisodes de paludisme au cours de l'année précédente). Une campagne pour s'attaquer à ce problème de santé sérieux est nécessaire de toute urgence.

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Introduction

Anaemia is a major child health problem worldwide [1–3]. One-third of the world's population suffers from anaemia, notably over half of the children in developing countries [1]. Iron deficiency is the main cause of childhood anaemia; other causes include micronutrient deficiencies, haemoglobinopathies and infections such as malaria [4–9]. Children are more vulnerable to developing anaemia because they are rapidly growing and liable to infection. Moreover, micronutrients such as iron and folic acid are likely to be inadequate in children's diets if parents are not well informed [2,9,10,11]. Anaemia is not only one of the leading causes of childhood mortality and morbidity [12], it may also affect cognitive development and school performance [13,14].

According to the World Health Organization (WHO), the prevalence of anaemia, defined as haemoglobin (Hb) level < 11 g/dL, among children aged under 5 years in Africa varies from 49% to 89% [1]. To our knowledge, few studies have investigated the prevalence of anaemia in Sudanese children [1,15–17] and there are no recent epidemiological studies. Nevertheless it is likely that it continues to be a significant burden on health facilities in the country, as documented in a survey conducted in 2006, which estimated the prevalence of anaemia in Sudanese children under 5 years old as 84.9% [12,15]. There have been changes in recent decades in the demography and socioeconomic status of the Sudanese community, both negative due to civil wars and natural disasters (flooding and desertification), as well as positive due to Sudan became an oil-producing country. We therefore undertook this epidemiological study to determine the prevalence of anaemia, and some of its determinants, in an area in the north of Sudan. This would help local health decision-makers to plan for prevention and comprehensive management of this important health problem [2,3,11].

Methods

Study area and population

The current study was conducted in Karma Albalad, which is a village in the Northern State of Sudan. It is located on the east bank of the River Nile, 60 km north of Dongola (the capital of the region). The population of the Northern State of Sudan is 750 000 according to the recent census, with the vast majority living in rural areas. About 10 000 people live in Karma Albalad, 800 of them in the age group 1–5 years according to Ministry of Health data from the expanded programme on immunization in Northern State [12]. Most of the residents of the village are farmers, while a few are labourers, employees or working abroad [18]. The educational facilities include 4 kindergartens, 5 mixed primary schools and 1 secondary school for girls. There is a health centre run by a medical assistant and a hospital with paediatric facilities in the nearby village of Alborgeig. We selected Karma Albalad as the study area because it is the biggest and most populous village in the Northern State. Furthermore, there are 4 kindergarten schools in this village while the other villages have only 1 or 2.

Although preschool education is not mandatory in Sudan, it is strongly recommended by the Ministry of Education. All kindergartens in Karma Albalad are public, with admission free of charge for all children. The great majority of parents admit their children to these kindergartens as it is widely believed among the local community that kindergarten improves the academic and social performance in later school years. There are no available data on the number of preschool age children in the village. However, children attending kindergartens are fairly representative of the preschool age group as they account for about nearly 20% of the children aged < 5 years in the village [12].

Study design and sample

This was a cross-sectional study. All children aged 3 –6 years who attended the 4 kindergartens in Karma Albalad on the day of the study (8 January 2010) were included in the study group. Written consent was taken from the local authority as well as from the parents of children participating in the study. Illiterate parents gave verbal consent to the research team members in the presence of a witness.

Data collection

The study team included the first author, 2 medical officers, 2 nurses and 2 laboratory technicians. The team members received training by the first author on the study technique. The first author also trained the kindergarten teachers on how to fill the questionnaire. The research team trained parents on how to fill the questionnaire. The research team and the teachers assisted parents, especially illiterate ones, who had difficulty in completing the questionnaire. Some of the parents who were comfortable with filling the questionnaire after the training session did so at home and returned it later. Children whose parents refused to participate in the study or failed to fill the questionnaire were excluded.

Questionnaire

The questionnaire was designed by the 2 authors and was pilot-tested on a group of school-age children not attending kindergarten to anticipate any problems in phrasing or understanding of the questions by parents. It was in Arabic language, which is the

language spoken by the local community. The questionnaire covered the demographic and socioeconomic status of the families. The first part of the questionnaire consisted of demographic information about the child (age, sex). The second part contained information about the parents (education, occupation, income). The third and main part of the questionnaire was on the health status of the child and the risk factors for anaemia including history of chronic diseases (asthma, diabetes, renal disease, tuberculosis), number of attacks of malaria in the last year and history of pica in the last 2 years. Frequent malaria attacks refers to having 4 or more malaria attacks in the last year. Education of parents was categorized as follows: illiterate, primary school, secondary school and post-secondary education. For income we adopted the Northern State local authority classification of families: poor (receiving government allowances) or not poor (not receiving government assistance).

Laboratory methods

A 2 mL blood sample was taken from all participating children. The Hb level was measured within 6 hours after collection using the HemoCue® system and Drapkins reagents. In this study, anaemia was defined as Hb < 11 g/dL. Mild anaemia was Hb < 11 > 9.9 g/dL, moderate anaemia was Hb 7–9 g/dL, while severe anaemia was Hb < 7 g/dL [1,2,9].

Statistical analysis

The data were entered and analysed using *SPSS*, version 17. The difference between 2 proportions test was used to test statistical significance. It was considered significant when *P*-value < 0.05.

Binary logistic regression test was used to determine risk factors associated with anaemia in the study population.

Results

Of the 189 children eligible for the study, 4 were excluded as the parents refused to participate and 13 failed to attend for testing. Questionnaires were distributed to the parents of 172 children, of whom 9 failed to fill and return the questionnaire. Questionnaire data and blood samples were therefore analysed for 163 children (94.8% response rate).

Table 1 shows the characteristics of the study group. There were 82 girls and 81 boys. A majority of the children (43.0%) were from large families (≥ 4 children), while the rest were from small families (< 4 children). Pica behaviour was reported in 17 children (10.4% of the study group). Fathers of 13.5% of the study children were illiterate while 7.4% had illiterate mothers. Fathers of 77.3% of children were farmers. A quarter of the studied children (24.5%) were from poor families (receiving regular allowances from the social authority).

Out of 163 studied children, 131 had Hb levels below the cut-off for anaemia, a prevalence of 80.4%. Anaemia was graded as mild in 81 (49.7%), moderate in 47 (28.8%) and severe in 3 (1.8%).

Table 2 shows that the prevalence of anaemia was not statistically significantly related to any of the studied demographic and socioeconomic factors (sex, economic status of the family, mother's literacy or family size) or health of the child (history of pica or number of attacks of malaria in the last year).

Discussion

Anaemia is a global health problem and is one of the major causes of childhood mortality and morbidity [1].As the epidemiological data on anaemia in Sudanese children are scarce [12], we decided to study the prevalence of anaemia in children as an important determinant of well-being.

In the present study the prevalence of anaemia among preschool children in Karma Albalad village was 80.4%. This is consistent with the results of the household survey conducted in Sudan in 1994, which reported a prevalence of anaemia in preschool children in Sudan as 84.9% [13]. This

Table 1 Characteristics of the study group of preschool children in Karma Albalad, Northern State, Sudan (*n* = 163)

Characteristic	No.	%
Sex		
Male	81	49.7
Female	82	50.3
Family characteristics		
Large family	70	43.0
Poor family	40	24.5
Illiterate mother	12	7.4
Health history		
Frequent malaria attacks	55	33.7
History of pica	17	10.4
Asthma	13	8.0
Type 1 diabetes	1	0.6
Recurrent urinary tract infection	1	0.6
Tuberculosis	0	0.0

Table 2 Risk factors associated with anaemia in preschool children in Karma Albalad, Northern State, Sudan (*n* = 163)

Risk factors	Anaemic Hb < 11g/dL (*n* = 131)		Not anaemic Hb ≥ 11g/dL (*n* = 32)		OR	95% CI	*P*-value
	No.	%	No.	%			
Sex							
Male	63	48.1	18	56.3	1.19	0.54–2.60	0.54
Female	68	51.9	14	43.8	1.19	0.54–2.66	0.54
Family characteristics							
Large family	58	44.3	12	37.5	0.78	0.30–1.76	0.55
Poor family	33	25.2	7	21.9	1.06	0.49–2.80	0.90
Illiterate mother	11	8.4	1	3.1	2.63	0.30–22.7	0.38
Health history[a]							
Frequent malaria attacks	45	34.4	10	31.3	0.88	0.37–2.06	0.37
Pica	16	12.2	1	3.1	0.23	0.03–1.80	0.16

[a]*Of the 13 children with asthma 6 had Hb ≥ 11 g/dL and 7 had Hb < 11 g/dL. The 1 child with type 1 diabetes had normal Hb and the 1 child with recurrent urinary tract infection had low Hb < 11 g/dL.*
Hb = haemoglobin; OR = odds ratio; CI = confidence interval.

alarmingly high prevalence of anaemia is comparable with results from studies conducted in other developing countries such as India and Nigeria [19–22]. The situation, however, is very different from that in developed countries [1,23]. For instance, the prevalence of anaemia in children in the United States of America has been reported as only 16% [1]. It is well known that the prevalence of anaemia rises with increasing poverty [24–26]. The high prevalence of anaemia in this study is therefore not surprising as Sudan is one of the poorest countries in the world. The recent Sudan poverty assessment prepared by the World Bank and the Sudan government stated that overall 46.5% of the population was below the poverty line with a higher rate (57.6%) among the rural population [27]. Other profiles present a detailed analysis of poverty, demographic, livelihood, education and employment in the country [28–30]. Our study was conducted in a rural area where the great majority of the parents were farmers with limited income and education.

People living in rural areas of Sudan constitute 86% of the population according to the 2008 census [29]. The rural community in Sudan is homogenous and the majority of people are from the same tribe, which explains the similarities in their social characteristics. When we analysed the possible risk factors associated with anaemia, such as parent's education, family size, family income and other socioeconomic indicators of poverty, none of these risks factors were statistically significantly associated with anaemia. This study was conducted in a rural village community where families are extended and share a similar culture; therefore the lifestyles of the people, especially eating habits, are expected to be relatively similar, despite differences in socioeconomic status. So, socioeconomic factors would not have as great an impact on children's nutrition as compared with urban communities. In contrast to our findings, Alawady et al. reported a high prevalence of anaemia among children with uneducated mothers in Kuwait [31]. In the USA too, parent's education was reported as a risk factor for the development of childhood anaemia [1].

Most of the children in this study were exposed to multiple attacks of malaria in the year prior to the date of the study. This is understandable as malaria is endemic in Sudan. However, recurrent attacks of malaria (≥ 4 times per year) were not shown to be a risk factor for anaemia in this study. Malaria causes anaemia by subjecting red blood cells to haemolysis [6]. Severe malaria as well as the presence of glucose-6-phosphate dehydrogenase deficiency (G6PDD) are known risk factors for development of haemolysis associated anaemia [32]. Mild malaria, however, is not usually a cause of anaemia, and most of the children in the current study had mild anaemia. While G6PDD is common in the west of Sudan, it is not in the north. All these factors may possibly explain the finding that malaria was not associated with anaemia in this study.

Relatively small numbers of anaemic children in the current study were reported to have pica, which was not statistically different from the numbers of non-anaemic children. Pica is a social stigma; therefore a

questionnaire-based study may not be the best way to obtain objective data on the prevalence of pica. This may be one of the limitations of the study. Other limitations include the relatively small study sample and the lack of a control group. Further investigations to determine the etiology of anaemia in these children were beyond the scope of this study. However, having more data as to the type and cause of anaemia would be informative. We recommend that a more comprehensive study on a wider scale would be helpful to validate our findings and to stimulate the authorities to address this important childhood health problem. Daily iron supplementation, for example, is a viable intervention to increase Hb levels [33]. A campaign to tackle this detrimental health issue is urgently needed.

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Association between dietary habits and body mass index of adolescent females in intermediate schools in Riyadh, Saudi Arabia

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الترابط بين العادات الغذائية و مؤشر كتلة الجسم لدى المراهقات في المدارس المتوسطة في الرياض، المملكة العربية السعودية

مي ناصر المعمر، منى محمد الشافعي، سمن فيروز

الخلاصة: تعتبر السمنة بين الشباب السعودي من التحديات المتنامية التي تواجه الصحة العمومية. وتستعرض هذه الدراسة المستعرضة قياس منسب كتلة الجسم، مع تحديد العادات الغذائية، وأنماط حياة 107 من المراهقات اللاتي تم اختيارهن بصورة عشوائية وتتراوح أعمارهن بين 12 و15 عاماً في مدارس الرياض. وتم قياس طول ووزن الطالبات، واستخدام استبيان تم اختباره مسبقاً لتجميع البيانات حول النظام الغذائي ونمط الحياة. وقد كان الدخل الشهري لغالبية أسر الطالبات يتجاوز 10 000 ريال سعودي (الدولار الأمريكي يعادل 3.75 ريال سعودي). وكان نصف الطالبات تقريباً (53.3٪) في حدود الوزن السَّوي، و28.6٪ ناقصات الوزن، و12.4٪ زائدات الوزن، و5.7٪ سمينات. وغالبية الطالبات لم يكن لديهن عادات غذائية أو بدنية صحية. ولم يكن هناك تفاوت كبير بين منْسَب كتلة الجسم، ونمط النظام الغذائي، وأسلوب الحياة. ومن ثمَّ يوصى بزيادة البرامج التثقيفية حول المفاهيم الغذائية الصحية من أجل تحسين الأنماط الغذائية للمراهقات.

ABSTRACT Obesity among Saudi youth is a growing public health challenge. This cross-sectional study measured body mass index (BMI) and determined the eating habits and lifestyle of 107 randomly selected female adolescent students (age 12–15 years) at schools in Riyadh. The students' heights and weights were measured and a pre-tested questionnaire was used to collect data on diet and lifestyle. The majority of the students' families had monthly income > 10 000 riyals (US$ 1 = 3.75 riyals). About half the students (53.3%) were within normal weight, 28.6% were underweight, 12.4% overweight and 5.7% obese. The majority of the students did not have healthy dietary or exercise habits. There were no significant differences between BMI category and dietary pattern and lifestyle. Increasing educational programmes with healthy dietary concepts to improve the dietary pattern of female adolescents is recommended.

Association entre les habitudes alimentaires et l'indice de masse corporelle chez des collégiennes à Riyad (Arabie saoudite)

RÉSUMÉ L'obésité chez les jeunes saoudiens est une préoccupation de santé publique croissante. La présente étude transversale a mesuré l'indice de masse corporelle puis a déterminé les habitudes alimentaires ainsi que le style de vie de 107 adolescentes sélectionnées aléatoirement (âgées de 12 à 17 ans) dans des collèges à Riyad. Le poids et la taille des collégiennes ont été mesurés et un questionnaire prétesté a été utilisé pour recueillir des données sur leur alimentation et leur style de vie. La majorité des familles des collégiennes disposait d'un revenu mensuel supérieur à 10 000 riyals (1 USD = 3,75 riyals). Environ la moitié des adolescentes (53,3 %) avaient un poids normal, 28,6 % souffraient d'insuffisance pondérale, 12,4 % présentaient une surcharge pondérale tandis que 5,7 % étaient obèses. La majorité des collégiennes n'avaient pas d'habitudes alimentaires ni sportives saines. Aucune différence significative n'a été observée entre la catégorie d'indice de masse corporelle, les habitudes alimentaires et le mode de vie. Une intensification des programmes d'éducation présentant des concepts sur une alimentation saine visant à améliorer les habitudes alimentaires des adolescentes est recommandée.

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Introduction

During adolescence, hormonal changes lead to accelerated growth, which is faster than at any other time in postnatal development, except for the first year of life [1]. Concern over adolescent obesity has mounted due to its rapid increase in prevalence, its persistence into adulthood, and its associated morbidity and mortality [2]. Numerous studies have demonstrated an association between body weight and eating behaviour [3], and cultural and socioeconomic factors also play an important role in the development of eating behaviour [4].

Al-Hazzaa et al. concluded that 84% of male and 91.2% of female Saudi adolescents spent >2 h daily on screen, and ~50% of boys and ~75% of girls did not meet daily physical activity guidelines [5]. The majority of adolescents did not have a daily intake of breakfast, fruit, vegetables and milk. Compared with boys, girls were significantly more sedentary, much less physically active, especially for vigorous physical activity, and there were fewer days per week when they consumed breakfast, fruit, milk and dairy products, sugar-sweetened drinks, fast foods, and energy drinks. However, girls' intake of French fries and potato chips, cakes and doughnuts, and candy and chocolate was significantly higher. There was a significant inverse correlation between screen time and intake of breakfast, vegetables and fruit. Conversely, physical activity had a significant positive relationship with fruit and vegetable intake.

Eating behaviour of adolescents can be influenced by both exogenous and endogenous factors. The most important exogenous factors are probably parents, peers, and the media [6]. Gender, intellectual ability, self-concept, and personality are among the endogenous factors that may influence the eating behaviour of adolescents [5].

The adverse health consequences that may result from excessive intake of soft drinks, sugared drinks and fast food; inadequate intake of fruit, vegetables, whole grain foods, dairy products and other calcium-fortified foods; reduced levels of exercise; and increasing obesity rates indicate a need to revisit the diet and lifestyle characteristics of this age group [7]. The present study investigated how the dietary habits of adolescent girls affected body mass index (BMI), which may be an indicator of future weight gain, and estimated the prevalence of overweight and obesity among students at intermediate schools in Riyadh.

Methods

Study design and participants

A cross-sectional study was carried out using a predesigned questionnaire to assess the relationship between dietary habits and BMI in 107 randomly selected adolescent female students; aged 12–15 years. The students were enrolled at intermediate levels of government schools in different areas of Riyadh, Saudi Arabia. There were 36 first level, 35 second level and 36 third level students.

Data collection

Body weight was recorded to the nearest 0.2 kg on a Digital Person Scale (ADAM Equipment, Danbury, CT, USA) without shoes and with light clothing. Body height was recorded to the nearest 0.5 cm using the same scale, and BMI was calculated as kg/m^2. BMI > 35 kg/m^2. Other patient data were collected by a questionnaire consisting of four sections and 36 items. Sociodemographic data included: age, parental education level, family size, type of house, and average family monthly income. Dietary data included: main meal, breakfast, water consumption, daily fruit and vegetable intake, daily snack consumption, daily milk consumption, satisfaction with body weight, attitude to weight loss and gain, effect of media on food choices, favourite food at school, drink preferences, and preferred food when watching television.

Analysis

Data were analysed using *SPSS* statistical software. The chi-squared test was used to assess the statistical significance of the association between BMI category and other variables. $P < 0.05$ was considered statistically significant.

Results

Sociodemographic data

Table 1 shows the sociodemographic characteristic (age, father and mother education, number of the family members, type of the house and average of family monthly income). The mean age of the sample was 13 years. For the majority of the participants their parents were university educated (90.7% for fathers and 67.3% for mothers). About half of the sample (53.3%) had between 7 and 10 family members. The majority lived in villas (86.0%) and their families had an average monthly income of > 10 000 rials (76%). More than the half of the sample had a normal BMI (53.3%), 28.6% were underweight, 12.4% overweight and 5.7% were morbidly obese.

Adolescents' dietary pattern

Table 2 shows that the main meal for the majority of the participants was lunch (76.2%); there was a non-significant difference between the BMI categories with regard to main meal ($P > 0.05$). Over half of the total number of participants ate breakfast (53.2%) with no significant relationship between the BMI categories and eating breakfast ($P > 0.05$). More than half of the studied sample (58.9%) drank less than 6 cups of water per day, again with no significant variation between daily intake of water and BMI category ($P > 0.05$). Just over 20% of the adolescents did not eat fruits and vegetables daily with a non-significant difference among

Table 1 Distribution of the studied adolescent females in some intermediate schools in Riyadh according to their sociodemographic characteristics

Sociodemographic characteristic	% (*n* = 107)
Age group (years)	
12–13	29.9
14–15	58.9
> 15	11.2
Father's education	
Illiterate	0.9
Primary	9.0
Secondary	7.5
University	90.7
Mother's education	
Primary	2.9
Preparatory	5.7
Secondary	22.9
University	68.6
Number of family members	
< 3	1.9
4–6	39.3
7–10	53.3
10+	5.6
Type of the house	
Villa	86.0
Apartment	3.7
Floor	3.7
Others	6.5
Family monthly income (Saudi rials)	
< 3000	1.0
3000–5000	5.0
5000–10 000	18.0
> 10 000 SR	76.0
BMI category	
Underweight	28.6
Normal weight	53.3
Over weight	12.4
Morbid obesity	5.7

BMI = body mass index.

the BMI categories ($P > 0.05$). There was nonsignificant difference between BMI categories and drinking milk daily with 26.2% of the total sample drinking milk daily. A large majority of the sample (89.5%) ate snacks daily with non-significant differences ($P > 0.05$) between BMI categories.

Table 3 shows the distribution of the studied sample according to the food and drinks they consumed at school: cheese sandwich, chips, chocolate and juice, were the food moist frequently eaten (45.5%, 39.9% ,36.6% and 35.6% respectively), with a nonsignificant difference between BMI categories ($P > 0.05$). Fizzy drinks and low-calorie fizzy drinks were the preferred beverage of the sample (78.2%, 59.4% respectively) with a nonsignificant difference between the BMI categories ($P > 0.05$). The preferred foods consumed by the studied sample when watching television were: fast foods followed by desserts/fizzy drinks (86.3% and 22.5% respectively). There was no significant variation between BMI categories ($P > 0.05$).

Approximately two-thirds (69.8%) of the adolescents reported that they were not satisfied with their weight Table 4). The majority of the sample (71.7%) wanted to lose weight while 88.6% said they did not want to gain weight. There was significant difference between BMI category and satisfaction with body weight, and the same pattern was found for increasing or decreasing body weight ($P < 0.05$).

Our results show that 61.0% of the sample thought that people were affected by the media.. Only 15.0% of the sample exercised daily, while 53.3% exercised about once a week

Discussion

Our study showed that the adolescent in this study, irrespective of BMI category, had some bad eating habits, including drinking < 6 cups of water per day, only eating fruits and vegetable sometimes, skipping meals, especially breakfast, eating snacks daily such as chocolate, sandwiches, chips, packed juices; they also had low daily milk consumption. Most also did not take part in regular exercise. These sorts of habits for the adolescents can lead to increases body weight in the future, and are likely to become regular habits for them and their families. Our findings are in agreement with other studies regarding unhealthy dietary, exercise and sleep habits of adolescents.

During adolescence hormonal changes accelerate growth in height. Growth is faster than at any other time in the individual's postnatal life except the first year so this may negatively or positively affect the consumption of food and dietary habits which may be related

Table 2 Distribution of the studied adolescent females in some intermediate schools in Riyadh according to adolescents eating pattern

Adolescents' eating pattern	Underweight (%) (*n* = 30)	Normal weight (%) (*n* = 56)	Overweight (%) (*n* =15)	Morbidly obese (%) (*n* =6)	Total (%) (*n* = 107)	Chi-squared	*P*-value
Main meal of the day							
Breakfast	10.0	11.1	0.0	16.7	9.5	5.373	> 0.05
Lunch	83.3	72.2	76.9	66.7	76.2		
Dinner	6.7	16.7	23.1	16.7	14.3		
Eating breakfast							
Yes	60.0	48.2	46.2	83.3	53.2	6.976	> 0.05
No	0.0	10.7	15.4	0.0	7.5		
Sometimes	40.0	41.1	38.5	16.7	39.3		
Daily water intake							
Less than 6 cups /day	56.7	34.0	7.0	4.0	58.9	1.473	> 0.05
6 to 8 cups /day	33.3	15.0	4.0	2.0	29.9		
More than 8 cups /day	10.0	7.0	2.0	0.0	11.2		
Daily fruit and vegetables consumption							
Yes	16.7	16.1	7.7	16.7	15.0	8.378	> 0.05
No	6.7	23.2	30.8	50.0	21.2		
Sometimes	76.7	60.7	61.5	33.3	63.8		
Daily milk consumption							
Yes	36.7	17.9	33.3	33.3	26.4	4.367	> 0.05
No	26.7	48.2	33.3	50.0	39.6		
Sometimes	36.7	33.9	33.3	16.7	34.0		
Daily consumption of snacks							
Yes	93.3	85.7	92.3	100	89.5	3.468	> 0.05
No	6.7	8.9	7.7	0.0	7.6		
>3 times	0.0	5.4	0.0	0.0	2.9		

Table 3 **Distribution of the studied adolescent females in some intermediate schools in Riyadh according to their preferred food**

Preferred food	Underweight (%)	Normal weight (%)	Overweight (%)	Morbidly obese (%)	Total (%)	Chi-squared	*P*-value
Food at school							
Cheese sandwich	60.0	37.7	41.7	50.0	45.54		
Burger	6.7	0.0	8.3	0.0	2.97		
Chocolate	26.7	41.5	41.7	33.3	36.63		
Biscuits	16.7	7.5	16.7	16.7	11.88		
Ice cream	6.7	1.9	8.3	0.0	3.96		
Fizzy drinks	10.0	11.3	25.0	0.0	11.88	0.629	> 0.05
Milk	0.0	1.9	0.0	0.0	0.99		
Juice	30.0	32.1	58.3	50.0	35.64		
Fruits or vegetables	3.3	0.0	0.0	0.0	0.99		
Nothing	0.0	5.7	8.3	0.0	3.96		
Chips and snacks	36.7	43.4	33.3	33.3	39.6		
Favourite drink							
Tea	13.3	5.7	.0	16.7	7.92		
Power drinks	10.0	17.0	7.7	0.0	12.87		
Fresh juice	13.3	28.3	23.1	0.0	21.78	0.228	> 0.05
Coffee	13.3	7.5	15.4	0.0	9.90		
Fizzy drinks	86.7	71.7	69.2	100.0	78.22		
Packet juice	10.0	30.2	30.8	33.3	24.75		
Low-calorie fizzy drinks	76.7	50.9	53.8	50.0	59.41		
Food preferred while watching television							
Fast foods	89.7	85.5	84.6	80.0	86.28		
Main meal	3.4	9.1	0.0	20.0	6.86	0.531	> 0.05
Coffee	0.0	0.0	7.7	0.0	0.98		
Desserts and fizzy drinks	31.0	20.0	23.1	0.0	22.55		
Fruits and vegetables	0.0	3.6	15.4	0.0	3.92		

to the community [8]. During this time, changes in adolescents' lifestyle may also affect eating habits and food choices. It has been shown that dietary quality decreases throughout childhood and adolescents have a poorer quality diet compared to younger children [9]. This study also indicated that there are no significant differences between the sociodemographic data and BMI. However, Nilsen et al. reported that the education of mothers of adolescents affected adolescents' health-related dietary habits [10]. Another study reported an association between socioeconomic factors and obesity among female school-aged children and adolescents in primary and intermediate schools [11].

Our finding about skipping meals concurs with other studies that found that adolescents tend to skip regular meals and instead of enjoying a balanced meal, consume fast foods during the day resulting in weight gain [12]. Many adolescents skip breakfast in particular or eat the wrong kind of breakfast [12]. Samuel points out that adolescents who skip breakfast are missing an opportunity to boost their nutrient intake, which has a negative effect on their learning performance and academic achievement [13].

As well as skipping meals, national survey data in the United States show that 88% of adolescents consume at least one snack per day, with a range of 1 to 7 [14,15] and snacks account for 25%–33% of daily energy intake among adolescents. Furthermore, food choices made by adolescents while snacking tend to be high in sugar, sodium, and fat, while relatively low in vitamins and minerals, which increase the risk for developing obesity, heart disease, osteoporosis, dental cavities and various types of cancer [16].

It is reported that watching television during family meals is associated with poorer dietary quality among adolescents and increased television viewing is associated with increased caloric intake, consumption of higher-fat food and lower intake of fruits and vegetables [17–19], which is in line with our

Table 4 Distribution of the studied adolescent females in some intermediate schools in Riyadh according to their attitude to their body weight

Attitude to weight	% (n = 107)
Affected by the media	
Yes	61.0
No	38.1
Some times	1.0
χ^2	5.323
Daily exercise	
Yes	15.0
No	31.8
Some times	53.3
χ^2	1.423
Satisfied with weight	
Yes	30.2
No	69.8
χ^2	15.688
Would like to lose weight	
Yes	71.7
No	28.3
χ^2	27.184
Would like to gain weight	
Yes	11.4
No	88.6
χ^2	19.521

results. Eating a diet rich in fruits and vegetables may be particularly important during adolescence due to the high nutrient needs in this rapid period of growth and development. Furthermore, the development of healthy eating patterns during adolescence, including an adequate fruit and vegetable intake, may lead to continued healthy eating patterns in adulthood [20].

A recent study in Saudi Arabia reported a predominance of unhealthy behaviours [21]. A similar study in Riyadh observed that the proportion of obese students inversely increased by age and schooling grade ($P < 0.001$). Ninety-five percent of the students living in villas or big houses were obese, clearly showing that the existence of obesity-promoting factors [22]. Thus obesity and physical inactivity among Saudi children and youth represent a growing public health challenge [23].

Almost 70% of our sample were not satisfied with their weight. Heilman reported that during adolescence many teenagers desire an ideal weight which relates to their image [7]. The media and advertisers reinforce unrealistic body weights as they convey to women and young girls that 10% body fat is the ideal when 22% body fat is in fact considered healthier [7]. At the same time, many adolescents who are overweight do not participate in sport and prefer to diet in order to maintain a slim figure instead of doing exercise to burn calories [8].

Conclusion

Our results show that there was no significant variation between BMI category and dietary pattern, but the dietary pattern of the adolescent females was unhealthy and most of them tended to skip meals. Increasing educational programmes which introduce healthy dietary concepts to improve the dietary pattern of female adolescents is recommended.

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Comparison of two assays in the diagnosis of toxoplasmosis: immunological and molecular

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مقارنة بين المقايسة المناعية والمقايسة الجزيئية في تشخيص داء المقوسات

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الخلاصة: لقد كانت الاختبارات المصلية للمقوسات الغوندية غير كافية نظراً لأن إنتاج المضادات كان إما يفشل أو يتأخر بشكل كبير. وقد تناولت هذه الدراسة التي أجريت في شرق العراق اختبار مقايسة الممتز المناعي المرتبط بالأنزيم لشدة الرغابة للغلوبلين المناعي IgG بغية اكتشاف حالات العدوى الحديثة بالمقوسات الغوندية لدى السيدات الحوامل، مع مقارنتها بالطرق المناعية والتفاعل المتسلسل للبوليميراز في تشخيص المقوسات الغوندية. وتم أخذ العينات المصلية من 130 سيدة حامل ممن يشتبه بإصابتهن بداء المقوسات إلى جانب 25 امرأة حامل حملاً طبيعياً كمجموعة شاهدة. فأظهر اختبار شدة الرغابة للضد IgM وIgG لنحو 50 عينة إيجابية، أن 15 عينة فقط فيها أضداد IgG منخفضة الرغابة. وتم تطبيق تقنية التفاعل المتسلسل للبوليميراز على 25 عينة مختارة. واكتشف دنا المقوسات في 15 من أصل 15 عينة ايجابية للضد IgM ذات الضد المنخفض الرغابة IgG وواحدة من أصل ثلاث عينات موجبة للضد IgM ذات الضد IgG عالي الرغابة. في حين لم يكن دنا المقوسات موجوداً في عينات سالبة للضد IgM ذات الضد IgG عالي الرغابة. ومما تقدم يمكن استنتاج أن استخدام اختبار شدة الرغابة للضد IgG عندما يستخدم بالتزامن مع اختبار الضد IgG وIgM بتقنية الامتزاز المناعي للرغابة المرتبط بالأنزيم، يوفّر مقايسة قيمة في استبعاد الإصابة السابقة أو تلك التي اكتُسبت مؤخراً بالمقوَّسات لدى الحوامل.

ABSTRACT Serological tests for *Toxoplasma gondii* are inadequate because antibody production either fails or is significantly delayed. This study in eastern Iraq investigated the IgG-avidity ELISA test for detecting recent *T. gondii* infections among pregnant women and compared immunological methods and PCR as molecular assays in the diagnosis of *T. gondii.* Serums samples were taken from 130 pregnant women at risk of toxoplasmosis and a control group of 25 women with normal pregnancy. Of 50 IgM- and/or IgG-positive samples, only 15 showed low IgG-avidity antibodies. PCR was performed on 25 selected samples. *Toxoplasma* DNA was detected in 15/15 IgM-positive with low IgG-avidity and 1/3 IgM-positive with high IgG-avidity. None of the IgM-negative with high IgG-avidity showed any *Toxoplasma* DNA. ELISA IgG-avidity when used in combination with ELISA IgG/IgM is a valuable assay for the exclusion of ongoing or recently acquired *T. gondii* infection in pregnant women.

Comparaison de deux dosages dans le diagnostic de la toxoplasmose : immunologique et moléculaire

RÉSUMÉ Les tests sérologiques pour *Toxoplasma gondii* sont inadaptés car la production d'anticorps soit n'a pas lieu, soit se produit très tardivement. La présente étude menée dans la partie orientale de l'Iraq a examiné le test ELISA d'avidité des anticorps IgG pour dépister les infections à *Toxoplasma gondii* récentes chez les femmes enceintes, puis a comparé les méthodes immunologiques et la méthode PCR en tant que dosages moléculaires pour la pose du diagnostic de l'infection à *T. gondii*. Des échantillons de sérum ont été prélevés chez 130 femmes enceintes à risque de toxoplasmose et 25 femmes appartenant à un groupe témoin dont la grossesse était normale. Sur 50 échantillons positifs pour les IgM et/ou les IgG, seuls 15 ont présenté un faible degré d'avidité des anticorps IgG. La méthode PCR a été utilisée sur 25 échantillons sélectionnés. L'ADN de *Toxoplasma* a été détecté dans 15 échantillons positifs aux IgM sur 15 ayant une forte avidité des IgG et dans un échantillon positif aux IgM sur trois ayant une haute avidité des IgG. Aucun des échantillons négatifs pour les IgM et ayant une forte avidité des IgG ne contenait d'ADN de *Toxoplasma*. Le test ELISA d'avidité des IgG, en utilisation combinée à un test ELISA d'avidité des IgG/IgM, constitue un dosage valable pour l'exclusion des infections à *T. gondii* contractées récemment ou actives chez les femmes enceintes.

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Introduction

Infection with the protozoan *Toxoplasma gondii* is one of the most common parasitic infections of humans worldwide [1]. In general, *T. gondii* infections are asymptomatic and self-limiting, especially among healthy immunocompetent hosts; however the infection may cause severe complications in pregnant women and immunocompromised patients [2,3]. Fetal toxoplasmosis, particularly in early pregnancy can cause miscarriage, stillbirth and birth defects [4]. Early first trimester maternal infection is less likely to result in congenital infection, but the sequelae are more severe [5,6]. The detection of recently acquired infection in pregnant women is therefore critical for clinical management of the mother and her fetus [7].

The diagnosis of toxoplasmosis is routinely based on serological tests for the presence of immunoglobulin (Ig)M and IgG-specific antibodies to *Toxoplasma* by enzyme-linked immunosorbent assay (ELISA) [8]. These tests, however, are not ideal because antibody production either fails or is significantly delayed. The IgG avidity test was developed to help discriminate between past and recently acquired infection [9]. The results are based on the measurement of the avidity (functional affinity) of *Toxoplasma*-specific IgG antibodies. Following an antigenic challenge, the antibodies produced usually have a low average affinity. During the course of the immune response, there is maturation of antibody affinity that increases progressively over weeks or months. IgG avidity, or the strength with which IgG binds to *T. gondii*, usually shifts from low avidity to high avidity at about 5 months after infection [10].

Most cases of active toxoplasmosis are due to reactivation of latent infections, which is why direct demonstration of the parasite in tissues or other fluids by polymerase chain reaction (PCR) assay is a major breakthrough for the diagnosis of toxoplasmosis in these patients [11,12]. PCR was first developed for diagnosis of congenital toxoplasmosis in amniotic fluid [13]. The detection of *T. gondii* DNA in blood has highlighted the possibility of anticipating the diagnosis compared with radiological findings and histology [14]. PCR assay is an important technique to evaluate the prevalence of *Toxoplasma* reactivation when the detection of circulating DNA is the only clue to its reactivation [15].

A comparison between IgM and IgG-avidity measurements can help in the detection of past or recent toxoplasmosis as verified by PCR. The aim of this study was to evaluate the utility of ELISA IgG-avidity test for detecting recent *T. gondii* infections among pregnant women and to compare immunological methods and PCR as molecular assays in the diagnosis of *T. gondii*.

Methods

Study subjects

This study was carried out on patients attending private clinics in Al-Suwaira province, Wassit governorate, in eastern Iraq from 1 December 2010 to 31 August 2011. A total of 130 pregnant women, with ages ranging from 18–36 years and median age 27 years, who were considered to be at high-risk of *T. gondii* infection (abnormal pregnancy outcomes), were enrolled into this study. Informed consent to participate in the study was taken from participants.

Data collection

A 5 mL venous blood sample was collected from all participants. Serum was separated from half of each sample and kept at –20 °C, while the other half of the sample was placed in a sterilized EDTA tube and stored at –80 °C for amplification by PCR. The entire study groups were screened for *Toxoplasma* infection with a rapid latex agglutination test (Latex-Toxo kit, Biokit Company).

Determination of IgM and IgG by ELISA

Presence of IgM and IgG antibodies were determined using ELISA Toxoplasma kits (ELISA Toxo-IgG and IgM, IBL International).

Determination of avidity index of IgG anti-T. gondii antibodies

Measurement of *Toxoplasma* IgG-avidity was performed and interpreted according to the directions of the manufacturer (Toxo-IgG-avidity; EUROIMMUN) using the ELISA system. The avidity index allows specimen classification as low (avidity index < 0.4 indicating an acute infection), borderline (avidity index 0.4–0.6) or high (avidity index > 0.6) avidity. A high-avidity index excludes primary infection within the previous 16 weeks.

Confirmatory testing for T. gondii by PCR

PCR assay was performed on 25 selected samples as a confirmatory test of *Toxoplasma* infection by targeting a recently discovered repetitive 529 bp DNA fragment in *T. gondii*. This sequence is more repetitive than the B1 gene, approximately 200 to 300 times, and is highly conserved. This region of the *T. gondii* genome has been reported to be a very specific and sensitive target for the diagnosis [16].

DNA was extracted from whole blood using a commercial purification system (AccuPrep Genomic DNA Extraction Kit, Bioneer). Conventional PCR was performed on all DNA samples to amplify a fragment of restriction endonuclease sequence. The specific primers for used for amplification of the sequence of *T. gondii* DNA were: (forward primer) 5′-AAG-GCG-AGG-GTG-AGG-AT-<g>-3′, MW 5693, melting temperature 65.3 °C; (reverse primer)

5′-GCG-TCG-TCT-CGT-CTG-GAT-<c>-3′, MW 5786, melting temperature 66.2 °C.

Sample cross-contamination problems were avoided following a number of precautions including performing DNA extraction in laminar flow hood with subsequent irradiation by ultraviolet light and use of 3 separated areas for the DNA extraction, preparation of PCR mixture, PCR amplification and running gels.

Statistical analysis

The experimental data are presented in terms of observed numbers and percentages. The Student *t*-test was used for statistical analysis. A *P*-value ≤ 0.05 was considered statistically significant.

Results

With the rapid latex agglutination test 72/130 women (55.4%) showed a seropositive result.

Of the women tested for specific anti-*Toxoplasma* IgM and IgG antibodies by ELISA, 50/130 pregnant women (38.5%) were positive for IgM and/or IgG using ELISA *Toxoplasma* Ab kit; 18/130 (13.8%) had *Toxoplasma*-specific IgM antibodies. When the IgG-avidity ELISA test was applied to sera from the 50 positive IgM and/or IgG individuals, only 15 of them showed low IgG-avidity.

The 25 samples selected for PCR included 15 IgM-positive with low IgG-avidity antibodies, 3 IgM-positive with high-avidity antibodies and 7 IgM-negative with high IgG-avidity antibodies (Table 1). PCR analysis detected *Toxoplasma* DNA in 16 of the selected samples, 15 (93.8%) of these were IgM-positive with low IgG-avidity antibodies and 1 (6.3%) was IgM-positive with high IgG-avidity antibodies. PCR was negative for 9 of the samples. None of the 7 IgM-negative with high IgG-avidity antibodies showed any *Toxoplasma* DNA (Table 1 and Figures 1, 2 and 3).

Table 1 Comparison between enzyme-linked immunosorbent assay (ELISA) IgM and IgG-avidity results in the detection of past or recent toxoplasmosis according to polymerase chain reaction (PCR) results in samples from pregnant women at risk of toxoplasmosis (*n* = 25 samples)

ELISA results		Total	PCR results	
IgG avidity	IgM status		DNA +ve (*n* = 16)	DNA –ve (*n* = 9)
		No.	No.	No.
Low	–ve	0	0	0
	+ve	15	15	0
High	–ve	7	0	7
	+ve	3	1	2
Total		25	16	9

+ve = positive; –ve = negative.

Calculating the accuracy of the test according to the PCR results showed that the sensitivity of IgM ELISA was 100.0% (16/16) and specificity was 77.8% (7/9), while for IgG-avidity sensitivity was 93.8% (15/16) and specificity was 100.0% (9/9).

Discussion

Routine serological diagnosis of toxoplasmosis provides high sensitivity, but the specificity varies depending on the test used. In this study, 18 (13.8%) pregnant women had *Toxoplasma*-specific IgM antibodies, suggesting an acute infection warranting appropriate therapeutic intervention. Generally, detection of anti-*Toxoplasma*-specific IgM antibodies is a sensitive indicator of an ongoing or recent infection. However, false-positive IgM antibody test results have been reported previously [14]. In such cases, the diagnosis of primary infection with *T. gondii* in early pregnancy can be improved by determination of anti-*Toxoplasma* IgG-avidity, which has the ability to discriminate between recent and prior infections. On avidity testing, 15 out of the 18 (83.3%) IgM-positive

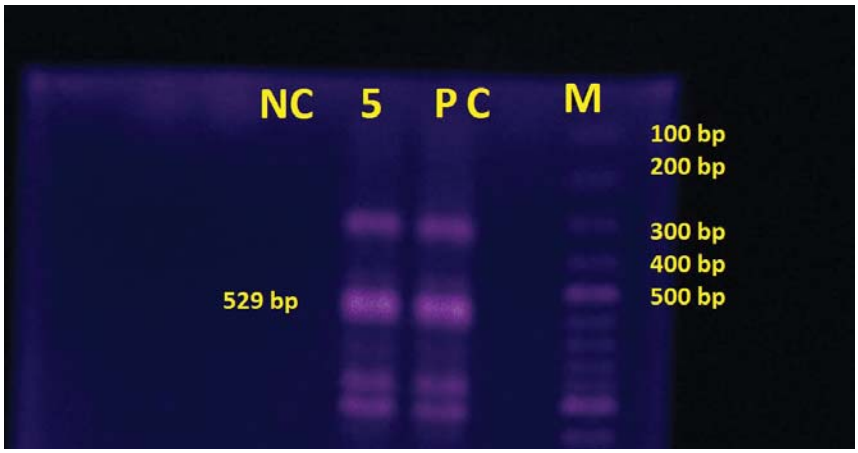

Figure 1 Amplification of 529 bp from *Toxoplasma gondii* DNA in the blood of abnormal pregnancy. Lane M, molecular weight marker (100 bp ladder), Lane NC, negative control, Lane PC, positive control, Lane 5, positive sample. Running conditions: agarose gel (2%), 5 v/cm for 2 h, stained with ethidium bromide

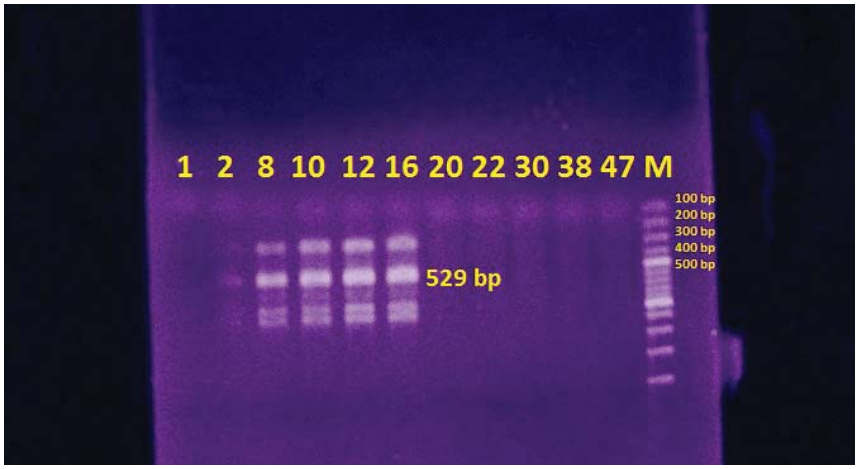

Figure 2 Amplification of 529 bp from *Toxoplasma gondii* DNA in the blood of abnormal pregnancy. Lane M, molecular weight marker (100 bp ladder), Lanes 8, 10, 12 and 16, positive samples. Lanes 1, 2, 20, 22, 30, 38 and 47, negative samples. Running conditions: agarose gel (2%), 5 v/cm for 2 h, stained with ethidium bromide

women had low-avidity IgG antibodies suggesting a recent *T. gondii* infection. More importantly, 3 (16.7%) of the 18 IgM-positive women had high-avidity antibodies suggesting that the infection was acquired before gestation. The apparent discrepancy in detecting infection status by IgM serology and avidity tests may be due to the fact that IgM antibodies may persist for months or even years following the acute phase of an infection in some individuals; thus the presence of IgM antibodies is not always an indication of a recent infection [17]. The presence of specific *T. gondii* IgM antibodies in the chronic stage of an infection, as observed in 16.7% of IgM-positive cases in this study, may have resulted in unwarranted concern and a misdiagnosis particularly in early pregnancy.

Previously it has been reported that the ELISA IgG-avidity test is highly sensitive and specific for detecting a recent *T. gondii* infection in IgM-positive cases [18]. Such results have confirmed in the present study by a sensitivity of 100%, while specificity was found to be 77.8%. It is also known that the maturation of the IgG response varies considerably between individuals and thus low-avidity antibodies may persist for months to more than 1 year [19]. In such patients, an avidity test result, if used alone, would have been misinterpreted as suggestive of an acute infection. Previous studies have documented that PCR can actually detect *T. gondii* in the blood of women before or during pregnancy [20,21]. Based on this, the presence of *Toxoplasma* DNA in the maternal blood probably indicates a recent infection or apparent parasitaemia, which is likely to be clinically significant. The clearance time for *Toxoplasma* DNA from the blood of patients with acute toxoplasmic lymphadenopathy was estimated to be 5.5–13 weeks [22].

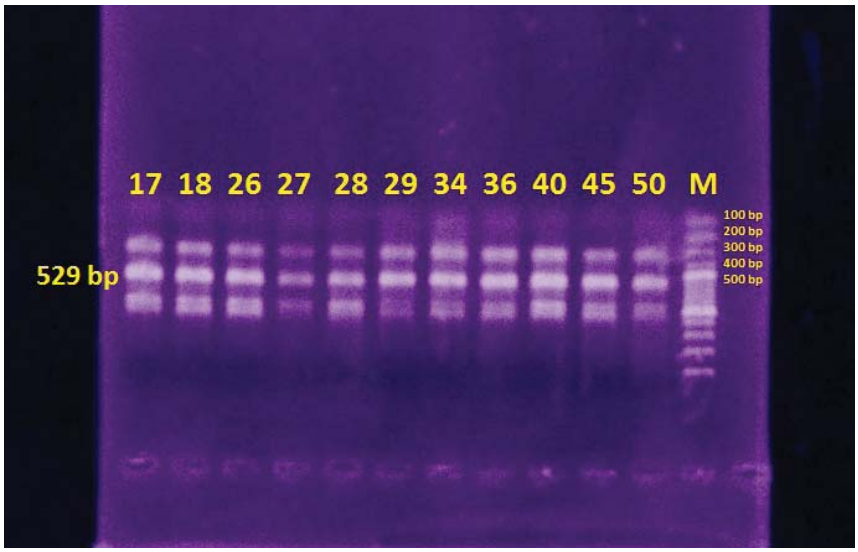

Figure 3 Amplification of 529 bp from *Toxoplasma gondii* DNA in the blood of abnormal pregnancy. Lane M, molecular weight marker (100 bp ladder), Lanes 17, 18, 26, 27, 28, 29, 34, 36, 40, 45, and 50, positive samples. Running conditions: agarose gel (2%), 5 v/cm for 2 h, stained with ethidium bromide

Conclusions

The results described in this study showed that the ELISA IgG-avidity test, when used as a confirmatory test along with the ELISA IgG/IgM tests in pregnant women, was useful in distinguishing a recently acquired infection from chronic infection. Confirmatory testing for ongoing or recent *Toxoplasma* infection with the ELISA IgG/ IgM antibody test and the ELISA avidity method in pregnant women has the potential to decrease the need for follow-up sera and for unnecessary therapeutic interventions in pregnant women. Despite the ease of use of ELISA tests, false positives were found among the high-avidity, IgM-positive samples, and therefore in well-equipped laboratories the application of PCR is recommended.

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Prevalence of coeliac disease among adult patients with autoimmune hypothyroidism in Jordan

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معدل انتشار الداء البطني بين المرضى البالغين ممن يعانون من قصور الدرقية المناعي الذاتي في الأردن

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الخلاصة: لم تتم من قبل دراسة معدل انتشار الداء البطني بين المرضى ممن يعانون من قصور الدرقية المناعي الذاتي سواء في الأردن أو سائر البلدان العربية. وقد تم إجراء مراجعة مستعرضة بالاعتماد على السجلات، لجميع المرضى البالغين ممن يعانون من قصور الدرقية المناعي الذاتي، وممن حضروا إلى مركز الإحالة في الأردن خلال ثمانية أشهر. وقد تم تشخيص الداء البطني لدى هؤلاء المرضى من خلال الطبيب المشرف على الحالة بالاعتماد على الاختبارات المصلية الإيجابية المضادة لغمد الليف العضلي للغلوبلين المناعي A والغلوبلين المناعي G، على أن يعقبها إجراء خزعة للاثناعشري للتحقق من تشخيص الداء البطني. ووجد أن 117 مريضاً من بين 914 مريضاً هم إيجابيو المصل للداء البطني بنسبة 12.8٪، ومن بين 87 مريضاً ايجابي المصل والذين أجروا خزعة الاثناعشري، هنالك 39 مريضاً لديهم نتائج هيستولوجية إيجابية للداء البطني (44.8٪). وبالاستقراء من هذه النتائج نجد أن المعدل العام للداء البطني لدى المرضى المصابين بقصور الدرقية المناعي الذاتي يقدر بنحو 5.7٪. ولقد ثبت من خلال التحوف اللوجستي المتعدد المتغيرات أن الداء البطني غالباً ما يصاحبه التقدم في العمر، (فوق سن الأربعين)، ووجود أمراض مناعية ذاتية أخرى، وعَوَز الفيتامين B12، وفقر الدم.

ABSTRACT The prevalence of coeliac disease among patients with autoimmune hypothyroidism has not been studied before in Jordan and other Arab countries. A cross-sectional record-based review was made of all adult autoimmune hypothyroidism patients who attended a referral centre in Jordan, during an 8-month period. Coeliac disease in these patients was diagnosed by the attending physician based on positive serological tests for anti-endomysial antibodies IgA and IgG followed by duodenal biopsy to confirm the diagnosis of coeliac disease. Of 914 patients recruited, 117 (12.8%) were seropositive for coeliac disease. Of 87 seropositive patients who underwent duodenal biopsy, 39 had positive histological findings of coeliac disease (44.8%). Extrapolating from these findings the overall rate of coeliac disease among autoimmune hypothyroidism patients was estimated to be 5.7%. In multivariate logistic regression coeliac disease was significantly associated with older age (> 40 years), presence of other autoimmune diseases, vitamin B12 deficiency and anaemia.

Prévalence de la maladie cœliaque chez des patients adultes atteints d'hypothyroïdie auto-immune en Jordanie

RÉSUMÉ La prévalence de la maladie cœliaque chez des patients atteints d'hypothyroïdie auto-immune n'a pas été étudiée auparavant en Jordanie, ni dans d'autres pays arabes. Un examen transversal à partir des dossiers de tous les patients adultes atteints d'hypothyroïdie auto-immune qui avaient consulté un centre d'orientation en Jordanie au cours d'une période de huit mois a été mené. Le diagnostic de maladie cœliaque de ces patients a été posé par le médecin traitant à partir des analyses sérologiques positives pour les anticorps anti-endomysium de classe IgA et IgG, puis d'une biopsie duodénale à visée de confirmation du diagnostic de maladie cœliaque. Sur 914 patients recrutés, 117 (12,8 %) étaient séropositifs pour la maladie cœliaque. Sur 87 patients séropositifs chez qui une biopsie duodénale a été réalisée, 39 ont eu des résultats histologiques positifs pour la maladie cœliaque (44,8 %). En extrapolant à partir de ces résultats, le taux global de maladie cœliaque chez les patients atteints d'hypothyroïdie auto-immune a été estimé à 5,7 %. Dans une analyse de régression logistique multivariée, la maladie cœliaque était significativement associée à un âge plus avancé (plus de 40 ans), à la présence concomitante d'autres maladies auto-immunes, à une carence en vitamine B12 et à une anémie.

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Introduction

Coeliac disease (gluten-sensitive enteropathy) is a systemic autoimmune disorder characterized by inflammation of the small-bowel mucosa, villous atrophy and crypt hyperplasia due to exposure to gliadin fraction of wheat gluten, hordein in barley, secalin in rye and aveninin oats and others in genetically susceptible individuals [1,2]. Based on the presence of anti-endomysial antibody (EMA) and anti-tissue transglutaminase (anti-tTG) antibody, with sensitivity and specificity reaching above 95%, the prevalence of coeliac disease has increased in subclinical cases and several risk groups over the past 30 years [3]. Coeliac disease is associated with many autoimmune endocrine disorders, particularly type 1 diabetes mellitus, autoimmune thyroid diseases and others [4,5]. In previous studies, coeliac disease was found to be more prevalent in patients with autoimmune hypothyroidism (AIH) with a prevalence of 3.3%–4.8% [6] compared with 1% in the general population [7].

To the best of our knowledge, the prevalence of coeliac disease among patients with AIH has not been investigated before in Jordan or other Arab countries. The aim of this study was to assess the prevalence of coeliac disease in patients with AIH in Jordan and to identify patients at higher risk of the disease.

Methods

Study population

A cross-sectional study was conducted at the National Centre for Diabetes, Endocrinology and Genetics, Amman, Jordan. All adult patients (a total of 914) with AIH who attended the Centre during the period October 2009 through May 2010, were included in the study. Exclusion criteria were hypothyroidism post-thyroidectomy or post-radioactive ablation therapy, pregnancy and thyroid malignancy.

Data collection

Clinical data

The diagnosis of AIH was made by the attending physician based on elevated thyroid-stimulating hormone (TSH) levels with reduced thyroxine and positive thyroid antibodies (anti-thyroid peroxidase and/or anti-thyroglobulin auto-antibodies). The diagnosis of coeliac disease was also made by the attending physician based on seropositivity of anti-EMA immunoglobulin (Ig)A and IgG. Patients who were seropositive for coeliac disease were further subjected to duodenal biopsy to confirm the diagnosis [8]. An experienced pathologist evaluated the biopsy according to the Modified Marsh Classification [9]. All data were collected from the medical records.

Laboratory measurement methods

Anti-EMA IgA and IgG levels were measured by generic assays (Dahlewitz GmbH), an enzyme immunoassay for the quantitative determination of IgA and IgG autoantibodies to human EMA. TSH, anti-thyroid peroxidase and anti-thyroglobulin levels were measured by 3rd-generation system (Axysym, Abbot), a microparticle enzyme immunoassay for the quantitative determination of TSH in human serum or plasma. All other measurements were carried out using standard techniques.

Ethical considerations

The study protocol was approved by the ethics committee of the National Centre for Diabetes, Endocrinology and Genetics. All data were kept strictly confidential and used for scientific purposes only. The study carried no harm to the patients as all data were obtained from routine medical records with no identifying information

Statistical analysis

The percentage of AIH patients with seropositivity to coeliac disease markers was obtained as well as the percentage of histologically confirmed coeliac disease. For the purpose of obtaining the overall rate of histologically confirmed coeliac disease in AIH patients, seropositive AIH patients who were not subjected to duodenal biopsy were assumed to be similar to those who underwent biopsy with respect to the percentage of histologically confirmed coeliac disease. The chi-squared test was used to determine the association of coeliac disease seropositivity with different variables. Multivariate logistic regression analysis was used to determine factors associated with seropositivity after controlling for potential confounders. The magnitude of the associations were expressed as odds ratios (OR). A 2-tailed *P*-value of 0.05 was considered statistically significant.

Results

Participants' characteristics

This study included 914 patients with AIH (806 females and 108 males) aged 20–82 years with a mean age of 51.1 years [standard deviation (SD) 13.4)]. The demographic, clinical and other relevant characteristics of the study population are presented in Table 1. The mean duration of AIH was 5.1 (SD 4.8) years, with almost 11% of patients having long-standing hypothyroidism of more than 10 years. The mean body mass index (BMI) was 32.2 (SD 6.7) kg/m^2; 60.7% of the AIH patients were obese and 26.8% were overweight. Around 42.2% had type 2 diabetes mellitus, 1.6% type 1 diabetes mellitus, 28.4% anaemia, 22.1% vitamin B12 deficiency, 67.9% vitamin D deficiency and 3.7% other autoimmune diseases. The mean thyroxine dose was 723 (SD 389) μg/week (Table 1).

Prevalence of coeliac disease among adult patients with AIH

The seroprevalence of coeliac disease was 12.8% (117 out of 914 patients).

Only 87 seropositive patients underwent duodenal biopsy, and of these 39 had positive histological findings

Table 1 Sociodemographic, clinical and other relevant characteristics of study participants with autoimmune hypothyroidism (AIH) (*n* = 914)

Variable	No.	%
Age (years)		
20–40	199	21.8
41–60	472	51.6
61–82	243	26.6
Sex		
Female	806	88.2
Male	108	11.8
BMI (kg/m²)		
Normal (< 27)	114	12.5
Overweight (27–29)	245	26.8
Obese (30+)	555	60.7
Duration of AIH (years)		
≤ 5	597	65.3
6–10	210	23.0
> 10	107	11.7
Anaemia		
Yes[a]	260	28.4
No	654	71.6
Thyroxine dose (µg/week)		
350–650	311	34.0
651–1000	504	55.1
> 1000	99	10.8
Diabetes		
Yes	386	42.2
No	528	57.8
Vitamin B12		
Deficiency[b]	202	22.1
Normal	712	77.9
Vitamin D deficiency		
Yes[c]	621	67.9
No	293	32.1
Other autoimmune diseases		
Present	34	3.7
Absent	880	96.3

[a]Haemoglobin level < 13 g/dL for males and < 12 g/dL for females [16]; [b]Vitamin B12 level < 208 pg/mL; [c]25-hydroxy vitamin D level < 30 ng/mL.

of coeliac disease (44.8%). The histological findings of coeliac disease were consistent with Marsh I in 5 (12.8%) patients, Marsh II in 8 patients (20.8%), Marsh IIIa in 12 patients (30.8%), Marsh IIIb in 10 patients (25.6%), and Marsh IIIc in 4 (10.3%) patients with AIH.

Assuming that the remaining 30 seropositive AIH patients who were not subjected to duodenal biopsy had the same rate of coeliac disease as those who underwent duodenal biopsy, the overall rate of coeliac disease among AIH patients was estimated to be 5.7% (Table 2).

Regression analysis

Using multivariate logistic regression analysis it was found that anaemia (adjusted OR = 3.7, *P* = 0.04), vitamin B12 deficiency (adjusted OR = 3.0, *P* = 0.01), and presence of other autoimmune diseases (adjusted OR = 3.1, *P* = 0.04) were significantly associated with coeliac disease (Table 2). In addition, older patients (> 40 years) were significantly 4.3 times more likely to have coeliac disease as compared with patients aged 20–40 years (*P* = 0.02). Each of these 4 variables were adjusted simultaneously for the other 3 variables. All other variables shown in Table 1, namely sex, BMI, duration of AIH, thyroid dose, presence of diabetes and vitamin D deficiency were not independently related to coeliac disease seropositivity and were therefore removed from the logistic regression model.

Autoimmune diseases in the study population

A total of 34 patients had other associated autoimmune disorders, such as type 1 diabetes mellitus, Addison disease and vitiligo as shown in Table 3.

Discussion

The present study was the first in Jordan to assess the prevalence of coeliac disease in patients with AIH. The sample size we used was relatively large as compared with many previous studies conducted outside Jordan. Recent population screening studies have found that the prevalence of coeliac disease in Western countries approaches 1% [10]. The present study showed that the prevalence of histologically confirmed coeliac disease among patients with AIH was 5.7%. This figure is slightly higher than the estimated range of global prevalence of coeliac disease among adult patients with AIH (3.3%–4.8%) [4]. The prevalences reported by Guilter et al. in a Turkish population [10], Berti et al. in Italians [11] and Hadithi et al. in Dutch patients [11] were 5.4%, 3.4% and 4.8% respectively.

Table 2 Multivariate logistic regression analysis of factors associated with coeliac disease seropositivity among patients with autoimmune hypothyroidism

Variable	OR	95% CI	*P*-value
Anaemia			0.04
Yes	3. 7	0.63–16.9	
No[a]	1		
Vitamin B12			0.01
Deficiency	3.0	0.91–17.1	
Normal[a]	1		
Other autoimmune diseases			0.04
Present	3.1	0.47–30.7	
Absent[a]	1		
Age years			0.02
20–40[a]	1		
> 40	4.3	1.04–28.1	

Each variable in the table was adjusted for all other variables in the table.
[a]Reference group.
OR = odds ratio; CI = confidence interval.

With respect to the seroprevalence of coeliac disease in patients with AIH, several studies reported higher figures than that for histologically confirmed coeliac disease [11–13]. Hadithi et al. reported a seroprevalence of coeliac disease of 15% in patients with Hashimoto thyroiditis using anti-gliadin, anti-EMA and anti-tTG [11], while Iuorio et al. reported a much higher coeliac disease seroprevalence of 27.4% using anti-EMA, both IgA and IgG [12]. Our data showed a much lower seroprevalence of coeliac disease (12.8%) than that reported by Iuorio et al. (27.5%) [13]. However, Iuorio et al.'s study was based on a much smaller sample size (113 AIH patients) than our study (914 AIH patients).

In the present study, age > 40 years, anaemia, vitamin B12 deficiency and presence of other autoimmune diseases were independently associated with the seroprevalence of coeliac disease. Consistent with our findings, Ravaglia et al. reported significantly higher prevalence of coeliac disease in patients with AIH aged ≥ 65 years than in patients aged < 65 years ($P = 0.02$) [14]. Our data showed that AIH patients aged > 40 years were 4.3 times more likely to have coeliac disease than patients aged ≤ 40 years ($P = 0.02$).

With respect to anaemia, our findings of an association are consistent with the findings of Unsworth et al. who reported that 6% of 483 anaemic volunteers had coeliac disease [15], and Zamani et al. who reported that 14.6% of 206 anaemic patients had coeliac disease [16].

Table 3 Autoimmune diseases in the study group of patients with autoimmune hypothyroidism (*n* = 914)

Disease	No.	%
Vitiligo	7	0.8
Addison disease	8	0.9
Systemic lupus erythematosus	2	0.2
Type 1 diabetes mellitus	15	1.6
Turner syndrome	1	0.1
Psoriasis	1	0.1
Normal	880	96.3

Vitamin B12 deficiency is common in Jordan (48.1%), as reported by Fora et al. [17], and this rate is higher than the reported global prevalence (ranging from 3% to 40% of the adult population) [18]. This difference is mainly related to ethnic variations and intestinal malabsorption problems [19]. To our knowledge, the association between vitamin B12 and coeliac disease had not been reported previously.

Our findings are consistent with a higher rate of coeliac disease in patients with other autoimmune diseases as had been previously reported by Kaukinen et al. [3]. Jiskra et al. found significantly higher serum levels of IgA anti-gliadin antibodies among 169 patients with autoimmune thyroid diseases, i.e. chronic thyroiditis and Graves' disease treated with a high replacement dosage of levothyroxine compared with patients treated with a lower dosage [14]. Our data, however, did not show an association between thyroxine replacement dosage and coeliac disease seroprevalence. This may be attributed to the use of anti-EMA antibodies in the present study, which have higher specificity and sensitivity than the IgA anti-gliadin antibodies used by Jiskara et al.

The present study had some limitations. First, it was a cross-sectional study, making it impossible to compare the prevalence of coeliac disease among patients with AIH and a control group. Secondly, we used only anti-EMA antibodies IgA and IgG as serological test for coeliac disease.

In conclusion, the prevalence of histologically-confirmed coeliac disease among patients with AIH in our study was estimated to be 5.7% compared with a seroprevalence of 12.8%. Age > 40 years, anaemia, vitamin B12 deficiency and the presence of other autoimmune disorders were significantly associated with a higher seroprevalence of coeliac disease. These findings may provide a basis for screening of patients with AIH for coeliac disease, particularly the higher risk groups identified in this study.

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Physicians' knowledge, attitude and practices regarding management of medications in Ramadan

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معارف الأطباء ومواقفهم وممارساتهم بشأن المعالجة الدوائية في رمضان

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الخلاصة: استلزم تقييم معارف الأطباء ومواقفهم وممارساتهم بشأن المعالجة الدوائية في رمضان من الباحثين استخدام استبيان يستكمل ذاتياً بشأن عينة الأطباء المستهدفة والبالغ عددها 381 طبيباً في مستشفى الجامعة الاردنية، ومستشفى الملك عبد الله الجامعي، وعدد من العيادات الخاصة في عمان خلال شهري أيلول/ سبتمبر وتشرين الأول/ أكتوبر من عام 2008. وبالفعل تم إعادة 297 استبياناً، وثبت أن معارف الأطباء ومواقفهم وممارساتهم بشأن المعالجة الدوائية في رمضان غير كافية بشكل عام. ويعتبر السن والجنسية والتخصص والبلد وسنة الحصول على آخر مؤهل ($P<0.05$) من العوامل الرئيسية التي تؤثر على معارف الأطباء ومواقفهم وممارساتهم، وقد سجلت الطبيبات نتائج أفضل من الأطباء، كما سجل الزملاء الخريجون نتائج أفضل من سائر المجموعات فيما يتعلق بالمعارف. وقد اتسقت معارف معظم الأطباء ومواقفهم وممارساتهم بشأن المعالجة مع الآراء الدينية فيما يتعلق بطريقة إعطاء الأدوية التي تفسد الصيام، مما يدل على أن الأطباء لديهم معرفة جيدة في هذا المضمار.

ABSTRACT To evaluate knowledge, attitude and practices (KAP) of physicians regarding the management of medications in Ramadan we used a self-administered questionnaire on a target sample of 381 physicians at Jordan University Hospital, King Abdulla University Hospital and a number of private clinics in Amman, during September and October of 2008. A total of 297 questionnaires were returned. Physicians' KAP about management of medications in Ramadan was generally insufficient. The main factors that affected KAP were age, nationality, specialty, and country and year of last qualification ($P < 0.05$). Female physicians scored better than males, and fellows scored better than other groups for knowledge. Most physicians' attitudes and practices were in line with religious opinion in regard to which routes of drug administration can nullify fasting, indicating that physicians have adequate knowledge in this area.

Connaissances, attitudes et pratiques des médecins en matière de gestion des médicaments pendant le Ramadan

RÉSUMÉ Afin d'évaluer les connaissances, les attitudes et les pratiques des médecins en matière de gestion des médicaments pendant le Ramadan, nous avons utilisé un autoquestionnaire dans un échantillon cible de 381 médecins dans un certain nombre de cliniques privées à Amman, ainsi que dans les établissements de soins Jordan University Hospital et King Abdulla University Hospital, en septembre et octobre 2008. Au total, 297 questionnaires ont été retournés. Les connaissances, attitudes et pratiques des médecins en matière de gestion des médicaments pendant le Ramadan étaient généralement insuffisantes. Les facteurs principaux qui affectaient les trois points analysés étaient l'âge, la nationalité, la spécialisation, ainsi que le pays et l'année de la dernière qualification ($P < 0,05$). Les médecins femmes ont obtenu de meilleurs résultats que les médecins hommes, et les boursiers ont obtenu de meilleurs résultats que les autres groupes pour les connaissances. La majorité des attitudes et des pratiques des médecins se situaient dans le droit fil des convictions religieuses pour identifier les voies d'administration des médicaments qui annuleraient le jeûne, indiquant que les médecins disposaient des connaissances adéquates en la matière.

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Introduction

About 2 billion Muslims throughout the world celebrate the holy month of Ramadan each year [1]: adult Muslims are required to refrain from taking any food, beverages or oral drugs, and to abstain from sexual intercourse between dawn and sunset. Since the lunar calendar is used to determine Ramadan, the timing changes each year and the duration of restricted food and beverage intake can vary from 12 hours during winter to 16 hours or more during summer [2,3].

The month-long fast should not induce any harmful effects in young healthy subjects. However, it can induce several complications in some patients with chronic diseases such as diabetes mellitus [4]. Although patients with serious illnesses, including diabetes mellitus, are exempt from fasting during Ramadan, most Muslims prefer to fast [5].

Patients taking medications during Ramadan face a dilemma in keeping up with their pre-Ramadan drug administration schedules. Routes of administration matter in this regard as certain routes do not nullify fasting. These routes have been specified by Muslim jurists, and scholars of religion, medical practitioners, pharmacologists, and specialists in other human sciences agree unanimously that some administration routes do not nullify fasting, e.g. eye and ear drops and all substances absorbed into the body through the skin, including nitroglycerin tablets placed under the tongue for the treatment of angina. Moreover, administration of drugs through injection into the skin, muscle, joints, or veins (with the exception of intravenous feeding) do not nullify fasting [3,6,7].

During Ramadan, accurate distribution of drugs prescribed twice a day is difficult to achieve between the break from fasting (*iftar*), which usually contains a sizeable amount of fat and carbohydrates, and the beginning of fasting (*sohour*), which is considered a breakfast-like meal, as the dosing time and time span between the doses are both altered. These alterations could affect the plasma concentration profile of the drug and, therefore, its efficacy and tolerance [8].

Islamic rules allow patients with chronic diseases such as diabetes and uncontrolled hypertension not to fast. However, if patients with diabetes wish to fast, it is necessary to advise them to undertake glycaemic control several times a day to prevent hypoglycaemia during daytime fasting or hyperglycaemia during the night [4]. In a 2007 study Ramadan fasting was shown to have injurious effects on the renal tubules in patients with stage 3 and stage 4 chronic kidney disease [9].

Ramadan provides an opportunity for health professionals to promote health improvement among patients by offering lifestyle advice on topics such as diet and smoking cessation, bearing in mind that in people with acute illness, fasting can be broken and made up later [6]. All patients who intend to fast should be counselled before Ramadan about changes in medication timings and doses, dietary changes, patterns of physical activity and the role of self-monitoring of blood glucose, especially during acute symptoms. Since most patients intending to fast do not come voluntarily for consultation immediately before Ramadan, it is imperative to make every effort to bring them to clinic before the commencement of fasting [10–12].

Ramadan is a unique model of intermittent fasting, and represents a great opportunity for scientific research [13]. Managing patients with chronic disease during the month is surely different from other months. Physicians managing patients with diabetes mellitus or renal failure should be aware of the possibility of hypoglycaemia/hyperglycaemia or dehydration in their patients. Even in other chronic conditions such as cardiovascular disease, it is important that physicians are able to handle patients' drug regimens and adjust medications to suite the patients' fasting schedule [4–6,9].

In general, there is no information on the knowledge, attitudes and practices of physicians about the management of medications in Ramadan. In this study, therefore, we aimed to explore physicians' knowledge, attitudes and practices regarding the management of medications in Ramadan in Jordan.

Methods

This study was conducted in 2 educational hospitals in Jordan, Jordan University Hospital in Amman and King Abdulla University Hospital in Irbid, as well as in a number of private clinics in Amman during Ramadan and the month after Ramadan 2008 (1429 Islamic calendar).

This cross-sectional survey was carried out during Ramadan and the month that followed (Shawwal), 1 September 2008–1 November 2008. We targeted the 2 university hospitals in Jordan, and for comparison, we also targeted all private clinics in all areas of Amman. We adopted the drop and pick-up technique for data collection. Since no previous studies had been conducted in this area, we did not perform a sample size calculation. We included all physicians present at the time of data collection in the target sites: a total of 380 questionnaires were distributed by hand. In Jordan University Hospital and King Abdulla University Hospital the questionnaires were delivered to the available physicians (interns, general practitioners, residents, fellows and consultants) during work days (Sunday to Thursday). Distribution to private clinics was carried out throughout the week to a convenience sample of privately practising physicians throughout Amman.

This survey employed a self-administered, anonymous questionnaire which was constructed by the authors. The initial draft of the questionnaire was examined by a panel of experts in various specialties (therapeutics, pharmacy practice and medicine) for face and content validity. Validity, reliability, and piloting measures were done prior to data collection. A statistician was consulted during the construction of the questionnaire for the design of the questions and statistical analysis afterwards. A pilot study was performed on 5% of the target sample at Jordan University Hospital, and questions were adjusted as appropriate.

The questionnaire had 2 parts. The first part gathered personal information: age, sex, nationality, place of work, current position, specialty, country of last qualification, and year of first qualification.

The second part had 9 questions, 1 open-ended and the remaining 8 closed. It investigated knowledge, attitudes and practices about management of medications in Ramadan.

Five questions were used to assess physicians' knowledge about management of medications in Ramadan, such as knowledge about drugs affected by circadian rhythms, the recommended regimen suitable for any patient who forgot to take his/her medication, alternative dosage forms and regimens suitable for Ramadan, monitoring of drugs with a narrow therapeutic index, and food–drug interactions.

Four questions examined physicians' attitudes and practices about management of medications in Ramadan such as the optimum time of administration of drugs that needed to be taken on an empty stomach, the recommended regimen suitable in case of taking the medication once or twice daily rather than more frequent dosing per day, administration routes that nullify fasting, and whether patients with specific chronic diseases should or should not fast during Ramadan.

Physicians were asked to complete the questionnaire and return it to an assigned collection station. They were informed that the researcher was a student in the Department of Clinical Pharmacy, University of Jordan. They were also informed about the aim of the study.

Approval to conduct the study was obtained from the Graduate Studies Committee at the Faculty of Pharmacy and the Deanship of Graduate Studies at the University of Jordan, and Jordan University Hospital Scientific Research Committee. Written permission was obtained to distribute the questionnaire.

The 5 knowledge questions were weighted to create a contrast to compare the results. For questions with choices of yes or no, "Yes" was scored 1 while "No" was scored 0. For questions that had more than 1 answer, each answer was scored individually. Only frequencies were obtained for the 4 attitude and practices questions; they were not scored, and each was analysed separately.

The data were coded and entered into *SPSS*, version 16. The data were analysed in several steps. First, each factor was examined using simple frequency tables. Any missing data in the returned questionnaires were excluded from the analysis.

Next, data were transferred from *SPSS* into the *Statistical Analysis System* (*SAS*), 2004. Stepwise regression analysis was performed on the knowledge criteria as a preliminary analysis to identify factors that might affect it.

Finally, factors showing statistically significant differences ($P < 0.05$) in the preliminary analysis were retested by least squares analysis of variance using the Generalized Linear Model procedures of *SAS*. Means for significant factors ($P < 0.05$) were compared using analysis of variance (ANOVA) and odds ratios were estimated using the chi-squared test.

Results

Out of 380 questionnaires delivered, only 297 were returned (response rate 78%).

The physicians who participated were predominately male (67%). Age range was 22–75 [mean 33.5, standard deviation (SD) 11.2] years. About 87% of participating physicians were Jordanians. Demographic details and distribution of participating physicians between the 2 hospitals and the private clinics are summarized in Table 1.

Physicians' knowledge about the management of medications in Ramadan was generally insufficient. The overall score for correctly answered question was 6.20 (SD 0.49) out of a total of 25.0.

In regard to drugs affected by the circadian rhythm and the optimum time for drug administration, the overall mean score was statistically significantly affected by the following factors: place of work ($P = 0.020$), current position ($P = 0.015$) and specialty ($P = 0.015$). Physicians working at private clinics had higher scores, mean 3.45 (SD 0.16) out of 10.00, for knowledge than physicians working at both King Abdulla University Hospital (mean 3.06; SD 0.20) and Jordan University Hospital (mean 2.72; SD 0.17). Consultant physicians got the highest scores for knowledge of drugs affected by the circadian rhythm.

The overall score in regard to potential food, drink and drug interactions was significantly affected by current position ($P = 0.0017$) and year of first qualification ($P = 0.0019$). Fellows got the highest scores (mean 1.51; SD 0.20), while 3rd and 4th year resident physicians scored the lowest (mean 0.52; SD 0.22).

Physicians knowledge about drugs affected by the recommended regimen suitable for any patient who forgot to take his/her medication one day during Ramadan, alternative dosage forms and regimens suitable for Ramadan and monitoring of drugs with

Table 1 Demographic details of participants (physicians) (n = 297) from Jordan University Hospital (JUH), King Abdulla University Hospital (KAUH) and private clinics

Characteristic	JUH		KAUH		Private clinics		Total	
Age (years)								
Mean (SD)	27.1 (5.01)		28.6 (6.38)		40.4 (12.24)		33.45 (11.18)	
Range (min–max)	23–52		22–56		24–75		22–75	
Sex	**No.**	**%**	**No.**	**%**	**No.**	**%**	**No.**	**%**
Male	46	46.9	44	65.7	115	89.1	205	69.0
Female	52	53.1	23	34.3	14	10.9	90	30.3
Missing data							2	0.7
Total	98	100	67	100	129	100	295	99.3
Nationality								
Jordanian	85	86.7	56	83.6	117	90.7	259	87.2
Non-Jordanian	13	13.3	10	14.9	11	8.5	34	11.4
Missing data			1	1.5	1	0.8	4	1.3
Total	98	100	67	100	129	100	297	100
Current position								
Intern	39	39.8	15	22.4	0	0.0	55	16.8
General practitioner	0	0.0	0	0.0	4	3.1	4	3.1
1st year residency	20	20.4	14	20.9	14	10.9	48	16.2
2nd year residency	16	16.3	14	20.9	14	10.9	44	14.8
3rd & 4th year residency	16	16.3	12	17.9	17	13.3	45	15.2
Fellow	3	3.1	5	7.5	40	31.0	48	16.2
Consultant	2	2.0	5	7.5	39	30.2	47	15.8
Missing data	2	2.0	2	3.0	1	0.8	6	2.0
Total	98	100	67	100	129	100	297	100

SD = standard deviation of the mean.

a narrow therapeutic index was also tested. The overall score for knowledge questions was significantly affected by physicians' specialty (P = 0.035), and year of first qualification (P = 0.0017). Family physicians scored higher than other specialties. As for the year of first qualification, fellows (graduating from medical school 4–5 years prior to the study) scored the highest.

In regard to doctors' opinions about which routes of administration do not nullify fasting, most physicians' attitudes paralleled what the religion recommends. Detailed results are shown in Table 2.

Attitude was affected by the following factors: current position, specialty and country of last qualification. Consultant physicians had a clearer idea about which route does or does not nullify fasting in comparison with interns and different levels of residency. Surgeons appeared to have a clearer idea about which routes nullify and which will not nullify fasting in comparison with other specialties.

About 26% of physicians who answered the (open-ended) question about the optimum time of administration of a drug that has to be taken on an empty stomach thought that the most suitable time was 1 hour before *sohour*. A less frequent response (23%) was to give the medication 2 hours after *iftar*. The least frequent option (16%) was to give the medication at 22:00–24:00 midnight.

Regarding doctors' practices in case of a patient taking a drug that needs to be given 3 times daily (such as ibuprofen 1 × 3), more than half the physicians (57%) indicated that they usually changed the drug during Ramadan to another from the same class that can be given once daily (such as piroxicam 1 × 1). A less frequent option (36%) was to change the dose of the drug so that it could be taken twice daily (such as ibuprofen 1 × 2) at *iftar* and *sohour*. The least frequent option (3%) suggested not changing the dosing and asking patients to break their fast.

In regard to physicians' practice in selecting which of their patients should be advised not to fast in Ramadan, the majority (80%) advised their patients to fast in most diseases except for uncontrolled hypertension stage 2, uncontrolled diabetes (both types) and chronic kidney disease stages 3 and 4 (Table 3). This practice was affected mainly by sex, nationality, current position and year of first qualification. Female physicians had greater tendency to instruct their patient to fast than male

Table 2 Physicians' knowledge in regard to administration routes that nullify or do not nullify fasting (*n* = 297)

Administration route	Nullify		Do not nullify		Not sure	
	No.	%	No.	%	No.	%
Eye and ear drops[a]	69	23.2	202	68.0	26	8.8
All substances absorbed into the skin such as creams, ointments and patches[a]	14	4.7	268	90.2	15	5.1
Vaginal pessaries, tablets, ovules and douches[a]	84	28.3	186	62.6	27	9.1
SC, IM or IV medications[a]	111	37.4	150	50.5	36	12.1
IV feeding (e.g. glucose)	269	90.6	8	2.7	20	6.7
Oxygen and anaesthetic gases[a]	71	23.9	205	69.0	21	7.1
Sublingual nitroglycerin tablets under the tongue for the treatment of angina[a]	195	65.7	78	26.3	24	8.0
Mouthwashes, gargles, oral sprays provided nothing is swallowed[a]	47	15.8	230	77.4	20	6.8
Nasal drops, spray, inhalers[a]	203	68.4	69	23.2	25	8.4
Suppositories, enemas[a]	140	47.1	132	44.4	25	8.5

[a]Does not nullify fasting (but important to ensure that nothing goes through the mouth if eye, ear or sublingual routes are used).
SC = subcutaneous; IM = intra-muscular; IV = intravenous.

physicians. Non-Jordanian physicians had a greater tendency to instruct their patients to fast than Jordanians. Consultant physicians had a greater tendency to instruct their patients to fast than interns and different levels of resident physicians and fellows had a greater tendency to instruct their patient to fast than interns and residents.

Discussion

In general, we found physician's knowledge seemed to be inadequate or incomplete. Physicians were specifically asked about certain drugs that are affected by circadian rhythms. Fasting during daytime, modifications in the sleep schedule, and social habits are elements that can induce changes in the rhythmic patterns of a number of hormones such as anti-diuretic hormone, cortisol, and aldosterone [14]. Thus, the circadian rhythm has to be considered an important factor that influences drug pharmacokinetics [8]. Despite the very low scores for all physicians in this study, there was a tendency for those working in private clinics to be more knowledgeable. This may be because the majority of physicians in private clinics are consultants and fellows with an average age of 40 years. Increasing age can have a positive effect on physicians' experience and subsequently their knowledge of medications, such as the optimum time of administration. Moreover, more fellows and consultants (~ 60%) were included in the private clinic sample than the university hospital samples (~ 20%). It is possible that the poorer response rate from fellows and consultants working in university hospitals could be because of teaching duties and having a busier practice.

During Ramadan, there is an increased possibility that one drug may interfere with another causing toxic drug interactions, particularly in elderly patients [15]. Consequently, frequent monitoring is recommended for drugs with a narrow therapeutic index. Private clinic physicians appeared to be more knowledgeable about monitoring of drugs with narrow therapeutic index than physicians in the university hospitals and this appeared to be clearly related to experience.

The compatibility of fasting with the various drug administration routes and their choice during Ramadan remains a matter for the doctor's own judgment. To settle differences in opinion and to standardise the choice of routes, distinguished Muslim jurists and religious experts, medical practitioners, pharmacologists, and specialists in other human sciences agreed unanimously on which administration routes nullify fasting and which do not [16]. The alternative routes of drug administration can help in adjusting patients' medications during Ramadan. Physicians and pharmacists should be able to advise patients and practitioners on the availability of these alternative dosage forms. Our study showed that the attitudes of most physicians' (especially consultants) are in line with religion opinion since most physicians know which administration routes nullify fasting and which do not. However, 3 routes of administration seemed to confuse physicians, these were sublingual nitroglycerin, nasal drops, and inhalers. The majority of physicians believed that those routes nullify fasting, although they do not as long as the patient is sure that nothing

Table 3 Distribution of physicians in regard to advising patients with specific conditions to fast or not to fast in Ramadan (*n* = 297)

Condition	Fast		Do not fast		Not sure	
	No.	%	No.	%	No.	%
Hypertension stage 1, controlled	251	84.5	11	3.7	35	11.8
Hypertension stage 1, uncontrolled[a]	176	59.3	86	29.0	35	11.7
Hypertension stage 2, controlled	239	80.5	20	6.7	38	12.8
Hypertension stage 2, uncontrolled[a]	73	24.6	189	63.6	35	11.8
Diabetes type 1, controlled	188	63.3	72	24.2	37	12.5
Diabetes type 1, uncontrolled[a]	45	15.2	223	75.1	29	9.7
Diabetes type 2, controlled	217	73.1	42	14.1	38	12.8
Diabetes type 2, uncontrolled[a]	57	19.2	206	69.4	34	11.4
Chronic kidney disease stage 1 (GFR ≥ 90 mL/min)	203	68.4	49	16.5	45	15.1
Chronic kidney disease stage 2 (GFR 60–89 mL/min)	150	50.5	106	35.7	41	13.8
Chronic kidney disease stage 3 (GFR 30–59 mL/min)[a]	51	17.2	208	70.0	38	12.8
Chronic kidney disease stage 4 (GFR 15–29 mL/min)[a]	28	9.4	228	76.8	41	13.8
Pregnant, 1st trimester	204	68.7	50	16.8	43	14.5
Pregnant, 2nd trimester	210	70.7	43	14.5	44	14.8
Pregnant, 3rd trimester	171	57.6	81	27.3	45	15.1
Lactating mother	162	54.5	89	30.0	46	15.5
Gastric ulcer[a]	169	56.9	95	32.0	33	11.1
Duodenal ulcer[a]	135	45.5	131	44.1	31	10.4
Asthma	200	67.3	58	19.5	39	13.2
Ischaemic heart disease	203	68.4	53	17.8	41	13.8
Heart failure	137	46.1	121	40.7	39	13.2
Dyslipidaemia	246	82.8	14	4.7	37	12.5

[a]*It is preferable for patients with this condition not to fast.*
GFR = glomerular filtration rate.

is swallowed into the gastrointestinal tract.

Generally, drug–food interactions may result in reduced, delayed, or increased systemic availability of a drug. In our study, 26% of physicians recommended that the optimum time to take the medication on an empty stomach is 1 hour before *sohour* because they believe that at this time the stomach is more likely to be empty. The next option was taking the medication 2 hours after *iftar*. However, it is doubtful that the stomach would be empty at this time. The least popular choice was taking medication between 24:00 and 24:00, which might be the least convenient for patients as they might eat around this time or be asleep.

Fasting by Muslims during illness can cause medical problems if not supervised by health-care professionals. Patients suffering from minor ailments usually do not have any problems when fasting. Those suffering from acute conditions may need advice about altering their dosing regimen. Drugs that are normally required to be taken frequently can be problematic for fasting patients. However, the increasing availability of alternative drugs with long half lives such as sustained release preparations have offered much needed assistance to fasting patients [15]. In this study, the majority of physicians advised their patients to fast except those who had diseases such as uncontrolled hypertension stage 2, uncontrolled diabetes types 1 and 2 and chronic kidney disease stages 3 and 4.

Blood pressure control in hypertensive patients on medications is not affected by fasting in Ramadan [16]. So, those with well controlled blood pressure through lifestyle modification and/or medications may fast.

Although people with diabetes may be exempted from fasting, a large proportion still choose to fast [17]. However, Ramadan fasting was shown to be acceptable for well-controlled type 2 diabetics conscious of their disease

and compliant with their diet and drug intake [4].

The effect of fasting during Ramadan on patients with renal impairment is still a matter of controversy [9]. Kidney disease patients should be aware of the importance of adequate hydration because dehydration is a common occurrence during a fast [6,17]. Chronic kidney disease patients (especially stages 3 & 4) insisting on fasting should be advised to drink sufficient fluids between *iftar* and sleep to avoid dehydration [9,18].

Consultant physicians had a greater tendency to instruct their patients to fast than interns, different levels of residents and fellows physicians. It may be that experience gives the doctor greater confidence about the consequences that patient may have because of fasting. This finding clearly highlights the effect of experience on the doctor's advice on whether to fast or not.

Conclusion

The study revealed that there is a significant lack of knowledge among physicians towards the proper management of medications in Ramadan.

It is preferable for patients suffering from chronic diseases to take advice regarding fasting in Ramadan from their consultant. With regard to drug schedule changes, there is a need to activate the role of the clinical pharmacist in giving appropriate counselling and suggesting alternative dosage forms for different medications along with physicians in order to help the patients dealing with different drugs properly and fasting Ramadan safely.

In conclusion, great care is taken to improve the quality of life of patients, nevertheless, a huge amount of respect is still shown for the pillars of Islam.

In general, little research has been done on the knowledge, attitudes and practices of physicians about the management of medications in Ramadan, so further studies are needed to explore this issue.

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Letter to the Editor

Termination of second and early third trimester pregnancy: comparison of 3 methods

Sir,

I am writing with regard to an article written by Bani-Irshaid et al. in the *Eastern Mediterranean Health Journal* in 2006 [1]. It is an enlightening article on the use of Foley catheters for the termination of pregnancy. The historical discussion of devices related to the research unfortunately contains inaccuracies.

The authors attribute the invention of the Foley catheter to Albert Krause in 1833. This is not correct. The Foley catheter is named after Frederic Foley who invented the inflatable latex rubber catheter with integrated balloon 100 years later than Krause [2]. While Embrey and Mollison did show how to use the Foley catheter for induction of labour in the 1960s [3] the first instantiations of inflatable Foley-like devices for induction were introduced by Antoine Mattei in 1855 [4] and Horatio Storer in 1859 [5]. Many also consider the work of Robert Barnes in improving similar inflatable rubber dilators in the 1860s [6] as key to later developments by Embrey and Mollison and others.

It is important to ensure that the historical record is accurate. However, none of this discussion on historical events should detract from the scientific results of Bani-Irshaid et al.'s work. Their conclusions about the safe and effective use of the Foley are in agreement with results from many other practitioners and researchers.

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دلائل إرشادية للمؤلفين

١. إن الأوراق البحثية المقدَّمة للمجلة الصحية لشرق المتوسط للنشر يجب ألا يكون قد تم نشرها من قبل، أو تم قبول نشرها، أو أنها قيد الدراسة بغرض النشر في أي مكان آخر (نرجو الرجوع إلى السياسة الخاصة بأخلاقيات النشر الخاصة بنا).ويحتفظ المكتب الإقليمي لمنظمة الصحة العالمية لشرق المتوسط بالحق في إعادة نشر وطباعة أي مادة علمية تظهر في المجلة الصحية لشرق المتوسط.

٢. إن الأوراق البحثية المقدَّمة للنشر في المجلة الصحية لشرق المتوسط يجب أن تتوافق مع المتطلَّبات الموحدة للمخطوطات المقدَّمة للمجلات الطبية البيولوجية التابعة للجنة الدولية لمحرري المجلات الطبية.

٣. التقديم: تقدَّم الأوراق البحثية الأصلية المكتوبة باللغة العربية أو الإنكليزية أو الفرنسية للدراسة عن طريق البريد الإلكتروني EMHJ@emro.who.int كما يمكن إرسال الأوراق البحثية لرئيس تحرير المجلة الصحية لإقليم شرق المتوسط، بالمكتب الإقليمي لشرق المتوسط، صندوق بريد 7608، مدينة نصر: (11371)، القاهرة، مصر. ويتم ترجمة ملخصات الأوراق البحثية التي يتم قبول نشرها إلى اللغات الثلاث. ولضمان كتابة أسماء المؤلفين المرفق أسمائهم بالملخصات العربية كتابة صحيحة، فإنه يتعيَّن على المؤلفين الذين تكون العربية هي لغتهم الأم، ويكتبون بالإنكليزية أو الفرنسية، أن يرفقوا أسماءهم بالكامل بالعربية، بالإضافة إلى كتابة الحروف العربية باللغة الإنكليزية أو الفرنسية.

٤. تخضع كل الأوراق البحثية المقترح نشرها لمراجعة الزملاء. ويحتفظ مجلس التحرير بالحق في قبول أو رفض أي ورقة بحثية استناداً إلى تعليقات المراجعين، والدقة العلمية ومدى الملاءمة للمجلة. ويتم قبول الورقة البحثية على أساس أنها تخضع للمراجعة الإحصائية والتحريرية إذا لزم الأمر، بما في ذلك تلخيص النص وحذف الجداول أو مادة الرسم البياني.

٥. الموضوعات: يتعيَّن أن يرتبط موضوع الورقة البحثية بالصحة العمومية، أو موضوع طبي بيولوجي متعلق بها، أو موضوع تقني يرتبط بمجالات المنظمة، وذي أهمية خاصة لإقليم شرق المتوسط.

٦. يتعيَّن أن يكون عنوان الورقة مختصراً قدر الإمكان، ويحبّذ ألا يزيد على 15 كلمة، على أن يرسل الاسم الكامل للمؤلف، والمؤسسات التي يكون عضواً فيها، وأعلى درجة علمية حصل عليها. لذا نرجو إرسال عنوان البريد الإلكتروني، والمعلومات الأخرى اللازمة للاتصال بالكاتب (العنوان البريدي، الفاكس، الهاتف). ويتعيَّن ألا يزيد عدد المؤلفين على سبعة، على أن يسهم جميع المؤلفين بشكل مادي في تصميم أو تحليل أو كتابة الدراسة، والموافقة على النسخة الأخيرة. ولن يسمح بإجراء أي تغيير يتعلَّق بالتأليف بعد قبول الورقة للنشر، وأي تغيير قبل ذلك يجب أن يقرّه جميع المؤلفين المدرجين. وقد يطلب من المؤلفين تأكيد مساهمتهم. كما يمكن تضمين أسماء أي مساهمين آخرين في الشكر والتقدير. نرجو الرجوع إلى الدلائل الإرشادية للجنة الدولية لمحرري المجلات الطبية فيما يتعلق بالتأليف والمساهمة.

٧. التقارير والمقالات البحثية: وينبغي في الأوراق التي تدون النتائج البحثية الأصلية اتباع الشكل الخاص: المقدمة والطرق والنتائج والمناقشة، على ألا يزيد نص التقارير والمقالات البحثية عن 3000 كلمة (ولا يتضمن ذلك الملخص المرفق، والمراجع، والجداول، والأشكال). ويتعيَّن تقديم ملخص لا يتعدى 150 كلمة ليوضح الأغراض والسياق والنتائج والخلاصة بشكل مختصر وواضح، بالإضافة إلى أن أقصى عدد للمراجع يجب ألا يتجاوز 25 مرجعاً، وكذلك عدد الجداول والأشكال يجب ألا يتجاوز واحداً لكل 1000 كلمة.

٨. مقالات حول المراجعات بمعنى التقييم النقدي للبحوث حول الموضوعات ذات الصلة بالصحة العمومية في الإقليم. ويتعيَّن أن تتضمَّن قسماً يتناول الأغراض، والمصادر، وطرق الاختيار، والتجميع وتفسير المعطيات والاستنتاجات. ويتعيَّن ألا يتعدَّى النص 3000 كلمة (ولا يتضمن ذلك الملخص المرفق، والمراجع، والجداول، والأشكال). وعلى أن يصحبها ملخص لا يزيد عن 150 كلمة؛ وألا يتجاوز عدد الجداول والأشكال واحداً لكل 1000 كلمة.

٩. تقارير الحالات: يتم دراسة نشر التقارير الخاصة بالحالات ذات الطبيعة غير المعتادة فقط. ويتعيَّن أن يشمل النص مقدمة، وتقرير الحالة، والمناقشة، وألا يتجاوز النص 3500 كلمة مع إيراد أقل عدد من المراجع. ولا يلزم في هذه الحالة تقديم ملخص.

١٠. رسالة إلى المحرر: يُرحَّب بتلقي الرسائل والملاحظات حول المقالات المنشورة في المجلة، وسترسل هذه الرسائل إلى مؤلفي المقالات الأصلية، للتعليق عليها. وينشر التعليق مصاحباً للرسالة، على أن يكون نص الرسائل موجزاً قدر الإمكان.

١١. الاتصالات الموجزة: إن المقالات التي لا تشكل دراسة بحثية مكتملة، ولكنها ذات أهمية خاصة لموضوعات الصحة العمومية في الإقليم يتم من حين لآخر دراسة إمكانية نشرها. ويتعيَّن ألا يزيد النص عن 1500 كلمة (ولا يتضمن ذلك الملخص المرفق، والمراجع، والجداول، والأشكال) وأن يصحبها ملخص لا يزيد عن 150 كلمة. ويجب ألا يزيد عدد الجداول والأشكال عن واحد لكل 1000 كلمة.

١٢. الاعتبارات الأخلاقية: متى وجب ذلك، يرفق بيان بموافقة لجنة الأخلاقيات ومجلس المراجعة في المؤسسة المعنيّة. ويتعيّن على المؤلفين إثبات أن جميع الأشخاص الذين شملهم البحث، قد وافقوا موافقة واعية كتابية وطوعية، وإذا لم يتمكن المشاركون (أحياءاً كانوا أم أمواتاً) من إعطاء هذه الموافقة، يتم الحصول على موافقة أوليائهم. وقد يطلب من المؤلفين تقديم نماذج الموافقة هذه، وحتى في حالة عدم إلمام المشاركين بالقراءة والكتابة، فقد تقبل الموافقة الشفهية.

١٣. تضارب المصالح: ينبغي أن يقدّم المؤلفون بياناً يوضح أي تضارب في المصالح بالتفصيل. يرجى الرجوع إلى الدلائل الإرشادية للجنة الدولية لمحرري المجلات الطبية.

١٤. تقديم المخطوطات في شكل إلكتروني (يحبّذ استخدام برنامج مايكروسوفت وورد) مع ترك مسافتين بين السطور. وأن يكون مقاس الورقة A4. أما بالنسبة للمخطوطات التي تقدَّم في شكل ورقي فيجب أيضاً ترك مسافتين بين السطور، وأن يكون حجم الورقة A4 على أن تتم الطباعة على وجه واحد من الصفحات.

١٥. المراجع: ينبغي أن يقتصر الاستشهاد من نصوص أي أعمال منشورة على المراجع الحديثة الأساسية. ويلزم ترقيم المراجع، كلما ظهرت في النص، وأن يليها إعداد عربية بين أقواس مربعة مثل: [1. 8-5]. كما ينبغي تدوين هذه المراجع في قائمة مرقمة، في صفحة منفصلة، في نهاية الورقة، وأن تتضمّن المعلومات التالية إن أمكن: اسم المؤلف، أو أسماء المؤلفين، والأحرف الأولى من أسمائهم، وعنوان الورقة البحثية أو الكتاب في اللغة الأصلية، إضافة إلى ترجمتها؛ وبالنسبة للمقالات البحثية، يتم ذكر الاسم الكامل للمجلة بالإضافة إلى رقم المجلد، وعدد الصفحات؛ وبالنسبة للكتب وسائر النصوص، يتم ذكر مكان النشر (البلد والمدينة) واسم الناشر (التجاري أو المؤسسة) وتاريخ النشر؛ وبالنسبة للنصوص التي تنشر حصراً على الإنترنت، يتم ذكر العنوان الإلكتروني للرابط (URL) الخاص بالصفحة المستشهد بها وتاريخ آخر وصول لها. بالنسبة للنصوص التي يشترك فيها أكثر من ثلاثة مؤلفين، يذكر اسم المؤلف الأول فقط يتبعه كلمة "وزملائه". وفي ما يلي أمثلة للأسلوب الذي تفضل المجلة الصحية لشرق المتوسط أن يتبع:

Book: Al Hamza B, Smith A. The fifth sign of identity. Cairo, American University Press, 1990. Journal article: Jones A et al. One day in Tibet. *Journal of tautology*, 1993, 13(5): 23-7
Document: Al-Itneen M, ed. *The principles of uncertainty*. Geneva, World Health Organization, 1985 (WHO/DOC/537)
Web text: *Child growth standards*. Geneva, World Health Organization, 2006 (http://www.who.int/childgrowth/en/, accessed 8 October 2008)

١٦. وفي ما يتعلّق بالرسومات والجداول، المشفوعة بالشروح الملائمة، فإنه ينبغي أن ترد كل منها في صفحة منفصلة، ومرقمة على التوالي بالأعداد العربية، وملحقة في نهاية الورقة. كما ينبغي الإشارة إلى كل رسم وكل جدول يشار إليه في النص، وحبّذا لو أمكن تحديد مصدر كل رسم وكل جدول. وفي حالة نقل أي رسومات أو جداول من مواد أخرى، فإنه تقع على عاتق المؤلف أو المؤلفين المسؤولية الكاملة عن الحصول على الأذون اللازمة. وبُغْيَةَ تجنب أي مشكلات في طريقة تنسيق المنتج النهائي، فإنه يتعيَّن الاقتصار قدر الإمكان في إدراج الجداول والرسومات. وينبغي تقديم الأشكال بالشكل الذي يسمح بتنقيحها، ويحبّذ برنامج ميكروسوفت إكسيل. وبالنسبة للأشكال المستندة إلى بيانات، فيجب أن ترفق بها هذه البيانات، مثل قوائم بيانات إكسيل على سبيل المثال لتيسير عملية إعادة الرسم إذا لزم الأمر. أما بالنسبة للصور والإيضاحات فينبغي إرسالها كملفات منفصلة، ويحبّذ في صورة JPG أو TIFF وألا يقل وضوح الصورة عن300 dpi. بالنسبة للمخطوطات المقدّمة بشكل ورقي، فينبغي إرفاق مجموعتين من الصور والأشكال الأصلية مع المعطيات الأساسية.

١٧. سيتم إعادة الأوراق المقدّمة والتي لا تلتزم بهذه الدلائل الإرشادية إلى المؤلف للتصويب قبل دراسة نشرها.

Directives à l'intention des auteurs

1. Les articles soumis pour publication à *La Revue de Santé de la Méditerranée orientale* ne doivent pas avoir été publiés, être en cours d'examen par d'autres revues, ou avoir été acceptés pour publication dans d'autres revues (veuillez vous reporter à notre Politique en matière d'éthique). Le Bureau régional de l'Organisation mondiale de la Santé (OMS) pour la Méditerranée orientale se réserve tous les droits de reproduction et de republication des matériels qui paraissent dans *La Revue de Santé de la Méditerranée orientale.*

2. Les articles soumis pour publication à *La Revue de Santé de la Méditerranée orientale* doivent être conformes aux *Uniform Requirements for Manuscripts Submitted to Biomedical Journals* [Exigences uniformes appliquées aux manuscrits soumis aux revues médicales, URM] de l'*International Committee of Medical Journal Editors* (Comité international des éditeurs de revues médicales, ICMJE).

3. **Soumission :** Les articles originaux rédigés en anglais, arabe ou en français peuvent être soumis pour examen par courrier électronique à l'adresse suivante : EMHJ@emro.who.int. Les articles peuvent aussi être envoyés au Rédacteur en chef, La Revue de Santé de la Méditerranée orientale, Bureau régional de l'OMS pour la Méditerranée orientale, BP 7608, Cité Nasr (11371), Le Caire (Égypte).
Les résumés des articles acceptés pour publication seront traduits dans les trois langues. Pour assurer que les noms des auteurs soient correctement écrits dans les résumés en arabe, les auteurs rédigeant en anglais ou en français mais dont la langue maternelle s'écrit en caractères arabes doivent fournir leur nom complet en écriture arabe et une translittération de leur nom en anglais ou en français.

4. Tous les articles dont la publication est envisagée seront revus par des pairs. Le Comité de rédaction se réserve le droit d'accepter ou de refuser tout article, sur la base des commentaires des réviseurs, de la rigueur scientifique et de la pertinence de l'article pour la Revue. Les articles sont acceptés sous réserve de la révision statistique et rédactionnelle dont ils feront l'objet, comme jugé nécessaire, ce qui peut amener à abréger le texte et à supprimer certaines données présentées sous forme de tableaux ou de graphiques.

5. **Sujets :** Le sujet de l'article doit concerner la santé publique ou un autre sujet biomédical ou technique connexe faisant partie du champ d'intérêt de l'OMS, et se rapporter plus particulièrement à la Région de la Méditerranée orientale.

6. Le titre de l'article doit être aussi concis que possible, et de préférence ne pas dépasser 15 mots. Le(s) nom(s) complet(s) du ou des auteur(s), leur(s) affiliation(s) institutionnelle(s) et l'intitulé de leur plus haut diplôme scientifique doivent être indiqués. Une adresse électronique et toute autre information permettant de contacter le ou les auteurs(s) (adresse postale, numéro de télécopie, numéro de téléphone) devront aussi être mentionnées. Le nombre des auteurs ne devrait pas être supérieur à sept.
Tous les auteurs devraient avoir apporté une contribution importante à la conception, à l'analyse ou à la rédaction de l'étude et avoir approuvé la version finale soumise. Aucun changement dans les noms des auteurs ne sera autorisé après l'acceptation de l'article pour publication ; avant cette acceptation, tout changement doit être accepté par l'ensemble des auteurs figurant dans la liste. Une vérification de leur contribution peut être demandée aux auteurs. Les noms d'autres contributeurs peuvent être inclus dans les remerciements. À ce sujet, veuillez vous reporter aux *ICMJE guidelines for authorship and contributorship* [Directives de l'ICMJE relatives à la qualité d'auteur et de contributeur].

7. **Articles et rapports de recherche :** Les articles présentant des résultats de recherche originale devront suivre le format IMRAD : introduction, méthodes, résultats, analyse et discussion. Le texte des articles et des rapports de recherche ne doit pas excéder 3000 mots (résumé, références, tableaux et figures exclus) Un résumé de 150 mots maximum sera fourni et mentionnera clairement et brièvement les objectifs, le contexte, les résultats et les conclusions. Le nombre maximal de références autorisées est de 25. Il ne faut pas inclure plus d'un tableau ou d'une figure tous les 1000 mots.

8. **Articles d'analyse** (évaluations critiques d'études de recherche sur des sujets pertinents concernant la santé publique dans la Région). Ils doivent être composés de paragraphes traitant des objectifs, des sources, des méthodes de sélection, de la compilation et de l'interprétation des données et des conclusions. Le texte ne doit pas excéder 3000 mots (résumé, références, tableaux et figures exclus) et doit être accompagné d'un résumé de 150 mots au maximum. Il ne faut pas inclure plus d'un tableau ou figure tous les 1000 mots.

9. **Études de cas :** Seules les études de cas inhabituels seront examinées pour publication. Le texte doit comprendre une introduction, un exposé du/des cas et une discussion. Il ne doit pas excéder 3500 mots et le nombre de références doit être minimal. Il n'est pas nécessaire de fournir un résumé.

10. **Lettres à la rédaction :** Les lettres commentant des articles publiés sont les bienvenues. Elles seront envoyées aux auteurs de l'article afin qu'ils fournissent leurs commentaires, qui seront publiés aux côtés de la lettre. Le texte des lettres doit être aussi court que possible.

11. **Communications brèves** : Les articles ne constituant pas une étude de recherche complète, mais présentant un intérêt ou revêtant une importance particulière pour les questions de santé publique dans la Région sont occasionnellement examinés pour publication. Le texte ne doit pas excéder 1500 mots (résumé, références, tableaux et figures exclus) et doit être accompagné d'un résumé de 150 mots au maximum. Il ne faut pas inclure plus d'un tableau ou d'une figure tous les 1000 mots.

12. **Considérations éthiques** : Le cas échéant, une déclaration devra être incluse, indiquant que le Comité d'éthique ou le Comité d'examen institutionnel de l'organisme concerné a donné son accord à l'étude.
Les auteurs doivent vérifier, le cas échéant, que toutes les personnes sur lesquelles la recherche porte ont donné leur consentement volontaire et informé par écrit et que si certains participants (en vie ou décédés) n'ont pas pu le donner, un consentement de substitution a été obtenu. Il peut être demandé aux auteurs de fournir ce type de formulaire de consentement. Lorsque les participants ne savent ni lire ni écrire, un consentement oral est acceptable.

13. **Conflits d'intérêts :** Les auteurs doivent fournir une déclaration détaillant tout conflit d'intérêts. Veuillez vous reporter aux directives de l'ICMJE (*ICMJE guidelines*).

14. Les manuscrits doivent être fournis en format traitement de texte (Microsoft Word, de préférence), A4 avec double interlignage. Les manuscrits soumis en version papier doivent être dactylographiés ou imprimés sur le recto seulement, sur des feuilles A4 avec double interlignage.

15. **Références :** Les citations dans le texte de travaux publiés doivent être limitées aux références essentielles récentes. Elles doivent être numérotées séparément à l'aide de chiffres arabes indiqués entre crochets, par exemple [1,5-8], selon l'ordre dans lequel elles apparaissent dans le texte. Les références doivent figurer sous forme de liste numérotée sur une page séparée après la partie « Discussion ». Elles doivent contenir les éléments suivants, selon le cas : nom(s) et initiales du ou des auteurs ; titre de l'article ou de l'ouvrage dans sa langue originale ainsi que sa traduction ; pour les articles de recherche, le nom complet de la revue ainsi que le numéro du volume et les pages concernées ; pour les ouvrages et autres textes, le lieu de publication (ville et pays) et le nom de la maison d'édition (commerciale ou institutionnelle) ; la date de publication ; pour les textes publiées exclusivement sur Internet, l'URL exact de la page citée et la date du dernier accès.
Lorsque les textes comptent moins de trois auteurs, tous les auteurs doivent être nommés. Lorsque les textes comptent plus de trois auteurs, seul le nom du premier auteur est mentionné, suivi de « et al. ».
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Al Hamza B, Smith A. *The fifth sign of identity*. Cairo, American University Press, 1990.
Article de Revue :
Jones A et al. One day in Tibet. *Journal of tautology*, 1993, 13(5): 23–7.
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Al-Itneen M, ed. *The principles of uncertainty*. Geneva, World Health Organization, 1985 (WHO/DOC/537).
Texte Web :
Child growth standards. Geneva, World Health Organization, 2006 (http: //www. who. int/childgrowth/en/, accessed 8 October 2008).

16. **Les figures et les tableaux** accompagnés des légendes appropriées doivent être placés chacun sur une feuille séparée, numérotés en chiffres arabes selon leur ordre et joints à la fin de l'article. Chaque figure et chaque tableau doit être référencé(e) s dans le texte, et le cas échéant, les sources doivent être indiquées. Si des figures, tableaux ou d'autres matériels ont été copiés d'autres sources, les auteurs portent l'entière responsabilité d'obtenir les autorisations nécessaires. Afin d'éviter les problèmes de mise en page lors de la production finale, le nombre de tableaux et de figures doit être aussi limité que possible.
Les figures doivent être fournies dans un format permettant les modifications, de préférence Microsoft Excel, et celles qui sont établies à partir de données doivent être accompagnées de ces données, sur une fiche technique Excel par exemple, pour permettre une recomposition, le cas échéant. Les photographies et illustrations doivent être envoyées dans des fichiers séparés. Les formats préférés sont JPG et TIFF, et la résolution des images doit être de 300 dpi au minimum.
Si les manuscrits sont soumis en version papier, deux jeux de photographies et de figures originales accompagnées des données de base doivent être fournis.

17. Les manuscrits ne respectant pas ces directives seront renvoyés à leur auteur pour correction avant d'être examinés en vue de la publication.

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