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CLINICAL & BASIC RESEARCH

The Changing Pattern of Hospital Admission to Medical Wards

Burden of non-communicable diseases at a hospital in a developing country

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تغير نمط التنويم لعنابر الباطنية في المستشفيات

عبء الأمراض غير المعدية في مستشفى في بلد نام

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ABSTRACT: ***Objectives:*** This study aimed to determine the pattern of hospital admissions and patient outcomes in medical wards at Atbara Teaching Hospital in River Nile State, Sudan. ***Methods:*** This retrospective cross-sectional study was conducted from August 2013 to July 2014 and included all patients admitted to medical wards at the Atbara Teaching Hospital during the study period. Morbidity and mortality data was obtained from medical records. Diseases were categorised using the World Health Organization's International Classification of Diseases (ICD) coding system. ***Results:*** A total of 2,614 patient records were analysed. The age group with the highest admissions was the 56–65-year-old age group (19.4%) and the majority of patients were admitted for one week or less (86.4%). Non-communicable diseases constituted 71.8% of all cases. According to ICD classifications, patients were admitted most frequently due to infectious or parasitic diseases (19.7%), followed by diseases of the circulatory (16.4%), digestive (16.4%) and genito-urinary (13.8%) systems. The most common diseases were cardiovascular disease (16.4%), malaria (11.3%), gastritis/peptic ulcer disease (9.8%), urinary tract infections (7.2%) and diabetes mellitus (6.9%). The mortality rate was 4.7%. ***Conclusion:*** The burden of non-communicable diseases was found to exceed that of communicable diseases among patients admitted to medical wards at the Atbara Teaching Hospital.

Keywords: Patient Admissions; Patient Outcome Assessment; International Classification of Diseases; Hospital Mortality; Sudan.

الملخص: الهدف: هدفت هذه الدراسة إلى تحديد نمط التنويم لعنابر الأمراض الباطنية ونتائج العلاج في مستشفى عطبرة التعليمي في ولاية نهر النيل بالسودان. **الطريقة:** أجريت هذه الدراسة المستعرضة الراجعة من أغسطس 2013 إلى يوليو 2014، وشملت جميع المرضى المرقدين في الأجنحة الطبية في مستشفى عطبرة التعليمي أثناء فترة الدراسة. تم الحصول على بيانات معدلات الاعتلال والوفيات من السجلات الطبية. تم تصنيف الأمراض باستخدام نظام الترميز الدولي للأمراض تبعا لمنظمة الصحة العالمية. **النتائج:** تم تحليل ما مجموعه 2,614 في سجلات المرضى. كانت الفئة العمرية الأعلى تنويما في المستشفى هي البالغة من العمر 65-56 عام بنسبة مئوية بلغت 19.4% وتم ترقيد غالبية المرضى لمدة أسبوع أو أقل (86.4%). شكلت الأمراض غير المعدية 71.8% من جميع حالات التنويم. وفقا لتصنيف الترميز الدولي للأمراض، تم ترقيد المرضى في معظم الأحيان بسبب الأمراض المعدية أو الطفيلية (19.7%)، تليها أمراض الدورة الدموية (16.4%)، ثم الجهاز الهضمي (16.4%)، و الجهاز البولي التناسلي (13.8%). كانت أكثر الأمراض شيوعا هي أمراض القلب والأوعية الدموية (16.4%) تليها الملاريا (11.3%)، ثم التهاب المعدة / مرض القرحة الهضمية (9.8%)، والتهابات المسالك البولية (7.2%) ومرض البول السكري (6.9%). بلغت نسبة الوفيات 4.7%. **الخلاصة:** لقد وجد أن عبء الأمراض غير المعدية تزيد على الأمراض المعدية بين المرضى الذين تم ترقيدهم بعنابر الباطني في مستشفى عطبرة التعليمي.

مفتاح الكلمات: تنويم المريض؛ تقييم نتائج المريض؛ التصنيف الدولي للأمراض؛ وفيات المستشفى؛ السودان.

Advances in Knowledge

- *This study explores the most common causes of hospital admission and inpatient death among medical wards at a health facility in the developing country of Sudan. The changing trend from communicable to non-communicable diseases (NCDs) is documented.*

Application to Patient Care

- *Health policies concerning patient care should be formulated according to the most common diseases encountered in health facilities. The findings of this study indicate that preventive measures should be directed towards NCDs as well as communicable diseases at the Atbara Teaching Hospital in north Sudan.*

In general, communicable diseases are the main causes of admission to medical wards in developing countries, while non-communicable diseases (NCDs) are the main causes in developed countries.[1] The exact pattern of illness among adults in sub-Saharan Africa has not been well studied;[2,3]

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however, the World Health Organization (WHO) predicts that by the year 2020 the causes of diseases and deaths in sub-Saharan Africa will have undergone a significant transition towards NCDs and away from infectious diseases.[4] This shift could be attributed to the increasing urbanisation and westernisation of populations in developing countries.[4]

The admission of patients to a medical ward is generally determined by age, coexisting illnesses, physical and laboratory findings, patient compliance with oral medication regimens and the resources available to the patient outside of the hospital.[5] In Sudan, as in many other African countries, epidemiological information on disease profiles is very limited; until 2013, there were no data available on the pattern of medical admissions.[6] Recently, a study by El Bingawi *et al*. determined that communicable diseases were the predominant cause of admission in Sudan.[7]

In Sudan, the River Nile State lies to the north of the capital of Khartoum and extends to the border of Egypt, covering an area of 124,000 m^2 with a total estimated population of 1,309,129 in 2013.[8] The Atbara Teaching Hospital is the main tertiary hospital in the River Nile State with a very wide catchment area and a capacity of 350 beds. The available specialties include internal medicine, surgery, obstetrics and gynaecology, paediatrics, orthopaedics, ear, nose and throat surgery, ophthalmology, dermatology and psychiatry. Routine laboratory, radiology, haematology and histopathology investigations are the main diagnostic modalities. It is known that identifying patterns of disease can help improve policy-making and facilitate the prioritisation of healthcare needs, as well as effectively influence the appropriate allocation of resources.[4] As such, the main objectives of this study were to assess the most common causes of admission to the medical wards at Atbara Teaching Hospital, the average duration of hospital stay and the in-hospital mortality rate.

Methods

This observational retrospective cross-sectional study was conducted from August 2013 to July 2014 on all patients admitted to the medical wards of Atbara Teaching Hospital. Patients under 16 years old and without complete medical records were excluded from the study.

The records of all of the admitted patients were reviewed by three medical students and validated by two consultants. The data collectors were trained in completing the structured data collection format prepared for the study. The dependent variables in this study were: reason(s) for admission (i.e. principal/provisional diagnosis), body system involved and outcome of admission. Other variables included age, gender, residence and comorbidities. The diseases were categorised using Version 10.0 of the WHO International Classification of Diseases (ICD) coding system.[9] The classification of diseases into communicable and non-communicable categories were based on the definitions used by the Centers for Disease Control and Prevention and the WHO.[10,11]

Data were entered into the Statistical Package for the Social Sciences (SPSS), Version 16.0 (IBM Corp., Chicago, Illinois, USA). Analyses were performed to obtain descriptive measures. Ethical permission for this study was obtained from the Ethical Committee of the Faculty of Medicine & Health Sciences at Nile Valley University, Atbara, Sudan (#NVU/FM/EA34/14). No patient consent was necessary as the records were reviewed following permission from the administration of Atbara Teaching Hospital. All information obtained was kept confidential and was used only for the purposes of this study.

Results

A total of 2,614 patients were admitted to medical wards during the study period. Of these, 1,316 were male and 1,298 were female (ratio: 1:1). The age of the patients ranged from 16–89 years with a mean age of 52.06 ± 18.9 years. The most common age group was

Table 1: Sociodemographic characteristics of patients admitted to medical wards at Atbara Teaching Hospital, River Nile State, Sudan (N = 2,614)

Characteristic	n (%)
Gender	
Male	1,316 (50.3)
Female	1,298 (49.7)
Age group in years*	
15–25	338 (12.9)
26–35	284 (10.9)
36–45	361 (13.8)
46–55	429 (16.4)
56–65	507 (19.4)
66–75	451 (17.3)
>75	235 (9.0)
Residence	
Urban	1,449 (55.4)
Rural	1,165 (44.6)

**Total number of patients for this variable was 2,605 due to missing data.*

Table 2: Reasons for admission by disease category* to medical wards at Atbara Teaching Hospital, River Nile State, Sudan (N = 2,614)

ICD category	Reason for admission	n (%)		
		Total	Male	Female
A or B	Infectious or parasitic diseases	516 (19.7)	273 (52.9)	243 (47.1)
C	Malignant neoplasms	46 (1.8)	30 (65.2)	16 (34.8)
D	Diseases of the blood	97 (3.7)	43 (44.3)	54 (55.7)
E	Endocrine, nutrition and metabolic diseases	190 (7.3)	85 (44.7)	105 (55.3)
G	Diseases of the nervous system	192 (7.4)	90 (46.9)	102 (53.1)
I	Diseases of the circulatory system	429 (16.4)	190 (44.3)	239 (55.7)
J	Diseases of the respiratory system	317 (12.1)	170 (53.6)	147 (46.4)
K	Diseases of the digestive system	428 (16.4)	229 (53.5)	199 (46.5)
M	Spondylopathies and musculo-skeletal disorders	22 (0.8)	7 (31.8)	15 (68.2)
N	Diseases of the genito-urinary system	361 (13.8)	188 (52.1)	173 (47.9)
O	Miscellaneous conditions	16 (0.6)	11 (68.8)	5 (31.2)

ICD = International Classification of Disease.

**Categorised using Version 10.0 of the World Health Organization's ICD coding system.[8]*

the 56–65-year-old group, which constituted 19.4% of all patients. The patients were predominantly from urban areas (n = 1,449; 55.4%) [Table 1].

According to ICD classifications, patients were admitted most frequently due to infectious or parasitic diseases (n = 516; 19.7%), followed by diseases of the circulatory (n = 429; 16.4%), digestive (n = 428; 16.4%), genito-urinary (n = 361; 13.8%) and respiratory (n = 317; 12.1%) systems [Table 2]. The most common diseases were cardiovascular disease (n = 429; 16.4%), malaria (n = 296; 11.3%), gastritis/peptic ulcer disease (n = 255; 9.8%), urinary tract infections (n = 188; 7.2%) and diabetes mellitus (n = 181; 6.9%). Additionally, 167 patients were admitted due to renal failure (6.4%), of which chronic kidney disease was the predominant cause. Of the patients admitted to medical wards, 720 had communicable diseases (27.5%), whereas 1,878 had NCDs (71.8%) [Table 3].

Table 3: Diseases causing admission to medical wards at Atbara Teaching Hospital, River Nile State, Sudan (N = 2,614)

Disease	n (%)		
	Total	Male	Female
Cardiovascular disease*	429 (16.4)	190 (44.3)	239 (55.7)
Malaria	296 (11.3)	162 (54.7)	134 (45.3)
Gastritis/peptic ulcer disease*	255 (9.8)	114 (44.7)	141 (55.3)
Urinary tract infection*	188 (7.2)	88 (46.8)	100 (53.2)
Diabetes mellitus*	181 (6.9)	83 (45.9)	98 (54.1)
Pneumonia	180 (6.9)	96 (53.3)	84 (46.7)
Renal failure*	167 (6.4)	98 (58.7)	69 (41.3)
Septicaemia*	167 (6.4)	79 (47.3)	88 (52.7)
Cerebrovascular accident*	131 (5.0)	57 (43.5)	74 (56.5)
Gastroenteritis	85 (3.3)	51 (60.0)	34 (40.0)
Anaemia*	79 (3.0)	36 (45.6)	43 (54.4)
Tuberculosis	69 (2.6)	49 (71.0)	20 (29.0)
Hepatitis	44 (1.7)	28 (63.6)	16 (36.4)
Bronchial asthma*	40 (1.5)	15 (37.5)	25 (62.5)
Typhoid fever	37 (1.4)	21 (56.8)	16 (43.2)
Other	266 (10.2)	149 (56.0%)	117 (44.0%)

**Non-communicable disease.*

The majority of patients stayed in the hospital for short periods, with 1,470 patients (56.2%) staying between one and three days and 788 patients (30.1%) staying between four and seven days. During the study period, the outcome of hospital admission was favourable in most cases with 78.0% of the patients showing improvement and being subsequently discharged. The rate of referral to other better-equipped centres was only 3.8%. There were 123 in-hospital deaths, constituting 4.7% of all admissions [Table 4]. The most common causes of death were septicaemia/sepsis (n = 31; 25.2%), cerebrovascular accidents/strokes (n = 23; 18.7%) and complications due to renal failure (n = 18; 14.6%) [Table 5].

Table 4: Duration of hospital stay and outcome of patients admitted to medical wards at Atbara Teaching Hospital, River Nile State, Sudan (N = 2,614)

Variable	n (%)
Duration of stay in days	
1–3	1,470 (56.2)
4–7	788 (30.2)
8–14	251 (9.6)
15–21	50 (1.9)
22–29	14 (0.6)
30–60	1 (<0.1)
Not documented	40 (1.5)
Outcome	
Improved and discharged	2,039 (78.0)
Not improved	11 (0.4)
Left against medical advice	157 (6.0)
Died	123 (4.7)
Discharged at patient request	3 (0.1)
Referred to other centre	98 (3.8)
Not documented	183 (7.0)

Table 5: Causes of death among patients admitted to medical wards at Atbara Teaching Hospital, River Nile State, Sudan (N = 123)

Cause of death	n (%)
Septicaemia	31 (25.2)
Cerebrovascular accident	23 (18.7)
Renal failure	18 (14.6)
Tuberculosis	6 (4.9)
Cardiovascular disease	5 (4.1)
Hepatitis	5 (4.1)
HIV/AIDS	4 (3.3)
Diabetes mellitus	3 (2.4)
Malaria	2 (1.6)
Other	26 (21.1)

HIV = human immunodeficiency virus; AIDS = acquired immunodeficiency syndrome.

Discussion

To the best of the authors' knowledge, this is the first study on the pattern of hospital admissions in the River Nile State and the second of its kind in Sudan as a whole.[5] Identifying the most common causes of hospital admission and in-hospital deaths is essential for policy-making and healthcare planning. Communicable diseases were previously believed to constitute the main burden of hospital admissions in developing countries.[1] The results of this study, however, demonstrate that there has been a considerable change; 71.8% of the admissions at the studied hospital were due to NCDs. This finding is in agreement with similar studies on hospital admission patterns conducted in Nigeria and South Africa.[12–14] However, findings from studies carried out in Ethiopia, Sudan and Pakistan indicated that communicable diseases were more prevalent.[1,6,15]

The change from communicable diseases to NCDs in the hospital admission patterns observed in the current study could be explained by the fact that more than half of the admitted patients were from urban areas. Increasing urbanisation can result in reduced physical activity, dietary changes and a rise in the rate of obesity.[4] In addition, the adoption of westernised lifestyles and habits by many rural communities may have played a role, as well as potential improvements in personal hygiene, environmental sanitation, health awareness and vaccine programmes. These factors, or a combination of them, may explain the reduced burden of communicable diseases in the River Nile State. Health professionals, policy-makers and health planners should be informed of the higher prevalence of NCDs over communicable diseases in this community.

Overall, cardiovascular diseases, when considered as a single disease entity, were the most common causes of hospital admission in the present study. This could potentially be explained by the increased prevalence of cardiovascular risk factors since there were many individuals with diabetes and/or hypertension. This explanation is supported by findings from a previous study carried out in the River Nile State that reported a high prevalence of undiagnosed hypertension (38.2%).[16] Since smoking is a common habit in developing countries such as Sudan, it could also be implicated in the high incidence of cardiovascular disease.[17] Renal diseases were also noted among the hospital admissions in the current study. This may be attributed to the high prevalence of diabetes and hypertension, but could also reflect an increased use of over-the-counter non-steroidal anti-inflammatory drugs.

The in-hospital mortality rate of the current study (4.7%) was lower than that found in similar studies in Ethiopia (12.0%) and Nigeria (12.3%).[1,18] This low mortality rate may, in part, reflect the comprehensive health services offered at Atbara Teaching Hospital. The most commonly reported causes of death (sepsis, stroke and renal failure) could likewise be explained by the high prevalence of hypertension and diabetes mellitus and the high percentage of older subjects in the current study population. Furthermore, a lack of access to early computed tomography scans and

fibrinolytic agents and poor stroke unit facilities may also have contributed to the high stroke mortality. Interestingly, although malaria was a common cause of admission, it was not a common cause of death, with only two malaria-related fatalities during the study period. This may reflect effective malaria management protocol and case management or other factors that have yet to be determined. Additionally, human immunodeficiency virus (HIV)/acquired immune deficiency syndrome (AIDS) was not a common cause of morbidity or mortality in the current study, despite the fact that the Atbara Teaching Hospital is a regional centre for the diagnosis and management of these conditions. This finding differs from the current HIV/AIDS situation in many neighbouring African countries.[1]

High rates of case improvement and patient discharge were observed in the current study. This could be attributed to a number of factors, for example the quality of services, follow-up and number of physicians at the Atbara Teaching Hospital as compared to other state hospitals in Sudan. The rate of improved and discharged patients (78.0%) was similar to the rate reported in a tertiary health centre in Nigeria, but lower than rates reported from hospitals in Ethiopia and Sudan.[1,6,18] In most cases, the average duration of hospital stay in the current study was one week or less (86.3%), which is consistent with similar studies carried out in Khartoum and Pakistan.[6,15] This could be explained by the fact that most acute communicable diseases, as well as uncomplicated NCDs, are treatable within this short timeframe.

The current study had several limitations; as it was a retrospective hospital-based study, problems associated with incomplete medical recordkeeping, missing data and under-reporting were encountered. These limitations were overcome as much as possible via a meticulous search and retrieval of the available data and the exclusion of patients with missing data. While acknowledging this shortcoming, in resource-poor countries such as Sudan where access to reliable epidemiological data is not always feasible, data such as those reported here constitute the best available alternative. Another limitation was the short one-year duration of the study period; conducting such studies for a longer period of time would provide stronger evidence for these findings. In view of the above, this study may not necessarily reflect the actual disease pattern in the community as a whole. However, in spite of these limitations, this study is novel and constitutes a basis for further studies on hospital admission patterns in River Nile State and across Sudan.

Conclusion

The pattern of hospital admission to medical wards at the Atbara Teaching Hospital indicated a predominance of NCDs over communicable diseases. Policy-makers and health planners should be made aware of the changing patterns of disease in this community.

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CONFLICT OF INTEREST

The authors declare no conflicts of interest.

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