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CONTAINMENT MEASURES IN SMALLPOX OUTBREAKS

by

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BY DR. K. MARKVART.

Out of 21 countries of EMRO Region 8 has already reached the stage of Smallpox free status the rest still being recognised as endemic including such highly endemic country like Pakistan (East and West) which accounts for more than 95 % of cases notified by Eastern Mediterranean Region during 1968.

An epidemiological situation such as this poses a permanent danger of introduction of infection into Smallpox - free areas .

In this age of air travel it is extremely difficult to recognize the person who may be a potential importer of infection at the airport and current measures as practised now offer only partial protection against this disease. The traveller who was once successfully vaccinated may passe through the control with a valid certificate showing only the date of revaccination. Examples of infection introduced by unsuccessfully revaccinated persons may be quoted from Poland, Germany, Great Britain and other countries.

Taking however into consideration the geographical and local conditions in countries of Eastern Mediterranean Region it should be pointed out that the importation of infection via airports is of lesser importance as compared with the frequency of introduction via uncontrolled crossing of borders between endemic and Smallpox - free areas. Therefore constant alert of Public Health Personnel all over the country regarding rapid communication and confirmation of diagnosis are the main pre-requisites for effective control of Smallpox outbreaks which might originate from imported case .

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Following is a brief account on steps to be undertaken and problems which may be encountered in the case of reintroduction of Smallpox infection into a non-endemic country.

The main feature of most Smallpox outbreaks investigated in non-endemic countries is the rather late recognition of the disease and establishment of the diagnosis report, which should trigger a chain of activities comprised under the epidemiological investigation aiming at :

1. confirmation of the diagnosis.
2. determination of the source of infection and investigation of all possible routes of transmission.
3. identification, location and classification of contacts for the sake of containment measures.
4. surveillance of the area for the presence of other cases together with retrospective analysis of records regarding occurence of Chicken Pox like disease and deaths due to it in the affected area.

Subsequent containment of the outbreak through the interruption of the chain of transmission is achieved by :

1. isolation of the cases, direct contacts who may be either put under the observation in the hospital or examined daily in their houses.
2. immediate vaccination of contacts, vaccination of residents and visitors to the affected communities in the case the control measures were instituted with delay and special groups at risk such as health personnel should be protected as well.

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Early diagnosis : Despite so often claimed clear clinical picture of smallpox, diagnosis of smallpox pose a real problem in non-endemic countries. During the recent European outbreaks in England, Poland, Germany etc. the disease remained unrecognized until the third or fourth generation. The recent epidemic of smallpox in one country of Eastern Mediterranean Region during which the index case was misdiagnosed as chicken pox and two other from subsequent generations were treated for measles or chicken pox inspite of their being seen by qualified physician may serve as example. No doubt in those cases time worked in favour of smallpox.

Diagnostic difficulties may be mainly sought first in the specific situation of non-endemic countries where population mostly enjoys certain level of immunity degree which varies to a wide extent so that the clinical picture of smallpox is liable to more modifications as compared with endemic countries. Secondly once being free of smallpox the possibility of its reintroduction starts fading from the minds of health personnel. While analysing the reasons for delayed diagnosis and looking for remedy it should however be made clear who are the persons in the countries of our region responsible for recognition of the disease e.g, the most important link in the defence line of the country.

To find answer to this question we have to raise another question. What is the most probable route by which the infection might be reintroduced into the non-endemic countries of EM region. From the glance on the map we may learn that many countries free of smallpox are adjacent to the endemic areas and because the frontiers are not air tight the uncontrolled

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crossing of frontiers by residents of either teritory will be for sometime the most important route of reintroduction of smallpox infection. The recent epidemic in Burma where smallpox was introduced from East Pakistan and the outbreak in the Sudan may be taken as an example. With the above in mind there cannot therefore be any doubt that the burden of the first diagnostic analysis lies mainly on the undergraduated field Public Health personnel.

Apart from the training of health personnel in colleges and other Para Medical Schools the subject of smallpox should be periodically brought up during the seminars or regular sessions of medical and Para Medical personnel regardless the field they are working, so that every body is aware of persisting danger of smallpox. Variety of clinical picture of disease under the conditions of partially immune population together with repetition of principles of epidemiological investigation, control measures, information regarding collection of specimens for laboratory investigation and review of present world wide smallpox situation should be discussed. Public Health personnel should be kept up to date as regards identification of endemic areas and accidental reintroduction of smallpox to adjacent non-endemic countries.

Teams of clinical and laboratory consultants established at the national level proved to be very helpful in the case of diagnostic hesitation. In the light of present epidemiologic situation as regards occurence of smallpox it may be mentioned that the misdiagnosis of smallpox on the right site e.g. false positive instead of false negative is the

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method of choice and the diagnosis of chicken pox in person who has just arrived from the endemic or potentially endemic area should not be made without considering smallpox.

Notification : If an early diagnosis is the first, the prompt reporting of suspect case of smallpox is the second pre-requisite which conditions the effectiveness of smallpox control.

For the sake of detection and notification of persons suspected of smallpox also other categories of health workers (Malaria), teachers and development project workers may be involved and be of great help. For instance in East Pakistan the best source of information are newspaper men. Very often,however,in spite of well set up net work of reporting sites and personnel involved, the report reaches the Public Health authority late as it takes comparatively long time to get the information from the layman level, teacher, village chief etc. to the professional level - vaccinator, Sanitary Inspector incharge of the area. This is being experienced in East Pakistan where theoretically the detection of cases should not be a problem due to the dense net of reporting sites in the field, but as a matter of fact the effectivity of the reporting channel is paralysed because of rather slow or nil communication between the two peripheral links.

The communication between the periphery and Public Health authority should be prompt and for that purpose all possible means like telegraph, radio or messenger should be employed. On the other hand prompt action following any report on a suspected case of smallpox is the best booster for cooperation.

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Public Health workers should of course be tought how to analyse the reports and statistical returns which are in many countries forwarded to higher authority without any comments. In the countries which got rid of smallpox only recently and are immediate neighbours of an endemic country, any new outbreak of chicken pox should be investigated thoroughly as far as the diagnosis is concerned and any excess of deaths due to chicken pox like disease should draw the attention of Public Health worker. The plain report showing number of attacks and deaths due to the smallpox reported sudenly from the area may help a lot in estimation of the extent of the problem as simultaneous occurrence of smallpox cases is very often a sign that the outbreak has already passed in the third or further generation. It is not necessary to mention that in the case of any new introduction of smallpox, chicken pox should be made notifiable if this is not being done and above all newly notified outbreaks of chicken pox - like disease should be treated as potential focus of smallpox until the final confirmation of diagnosis.

Epidemiological investigation : Even though the investigation of smallpox outbreaks is mostly carried out by special teams in co-operation with local public health authorities, health personnel working in different fields of health services should be involved as well and kept informed on the progress of the work.

As mentioned above the confirmation of the preliminary diagnosis is the first step to be undertaken. The consultation of specialist and collection of specimens for laboratory investigation is desirable. Laboratory Assistance is indispensable especially in country where the physicians are

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not very much familiar with the diagnosis of smallpox. Quick diagnostic method for screening of cases detected by surveillance is required to be mastered by local laboratories.

In laboratory diagnosis, even negative results of virus isolation experiment does not exclude the diagnosis of smallpox. There is always a chance of laboratory mistake, mishandling of specimen, or technical failure. Since the final diagnosis may be a matter of few days, all necessary control measures should be undertaken without delay. Better to make a mistake on the false positive side.

The determination of source of infection is facilitated by well known epidemiologic features of smallpox - the only source of infection is man, transmission of the infection from the infected individual to the susceptible one is a matter of a limited period, infection is followed by solid immunity and no carriers have been observed so far.

Detailed account of movement of the affected person provides the basic information by which the source of infection and chain of transmission may be determined. In most cases the affected person is able to recollect his movements during last 16 days and give information on contact with other person suffering at that time from influenza - like disease with fever, headache and pain in back or from a disease accompanied by any sort of rash eventually with patient dying after being seriously ill for a few days. Investigation should take into account the way of life and profession of the infected person and his information is advisable to be further complemented by the interview of his relatives and neighbours to fill up possible and unitentional gaps.

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If the affected person has been unknown to this surrounding, a brief account of the case may be found useful in piecing together the chart of his movement and identify his contacts.

In order to give some guidance to the investigator and to prevent omission of vital questions the investigation forms should be prepared well in advance. To put right question at the right moment is not so easy.

Construction of movement charts helps in identification and classification of contacts which in turn helps to establish the priority of containment measures to be instituted.

Generally and in accordance with WHO recommendations the contacts may be classified into three groups/WHO Expert Committee on smallpox, Techn. Series 283, 1964.

1. Inner ring contacts - This group comprises members of the same family including those who met patient face to face beginning two days prior to the onset of rash until his scabbing period.

2. Outer ring contacts - Persons who did not establish direct face to face contact e.g. possible rather than definite contact such as visitors to the house, neighbours as well as persons who were in contact with persons stated under 1. In the case of smallpox introduced by traveller also persons in transient contact during the period of patient's infectivity may be included into this group.

3. Doubtful contacts - include persons who live or work in the same locality but definitely have no contact with sick person or with the persons included in the inner contact group.

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No matter how accurate the information on contacts may be, the surveillance activities in the affected area should be reinforced beginning by the screening of all feverish patients treated in outpatients, patients treated or admitted for disease accompanied by rash in hospitals upto the point of house to house search for hidden cases in slums and rural areas. Plan of action for this move should take into account the pattern of movement of population under question during the incriminated period-markets, religious gatherings etc.

Radio and newspaper announcements will help a lot in the enhacement of public co-operation. Every body will be aware of occurence of smallpox and would not hesitate to consult his physician. All health personnel on the other hand should be kept informed on the organization of containment measures including the surveillance activities and be directed to send all such person who called in their outpatients for the proper screening to the diagnostic center. Location and function of this establishment should be given good publicity so that people can easily find it.

Distribution of information is utmost important part of surveillance and the list of " to be informed " should also comprise the adjacent countries to enable them to take any precautions without delay.

Containment measures : Isolation of the source of infection as well as the inner contacts is theoretically well founded and classical but unfortunately not possible to be applied in any conditions which goes especially for contacts. In the urban areas with isolation facilities this will undoubtedly be much more feasible whilst in rural areas the isolation

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of this persons will sometimes pose a problem. The villagers will be reluctant to be separated from their families in provisional isolation camps, even though located in the close vicinity of the village. Before taking any decision in this respect, local conditions, number of patients and further problem of their feeding and nursering should be thoroughly weighed. The experience gained in Africa with this kind of establishments are not similar.

As regards to close contacts, it may appear better, to put them under close surveillance thus diminishing the possible hardship which would be caused by their entire isolation. Daily measurement of temperature and from the beginning of the ninth day of their incubation period a check up by experienced staff should be sufficient for noting any irregularity of their health status. Persons being in contact with those belonging to the inner ring contacts should be preferably treated in the same way.

From the epidemiological studies it is clear that the transmission of infection is mostly through contact and is most frequently within the families or compounds. The most effective approach is the creation of protective barrier by vaccination of all contacts upon their identification and location, that is, visitors to the infected person and immediate neighbourhood.

Vaccination policy, however, depends largely on the local conditions, the availability of staff and on the time at which the patient was detected for the first time e.g. when the containment measures were implemented.

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In principle two attitudes as regards strategy of containment vaccination may be pursued throughout the literature dealing with the subject of containment measures in smallpox outbreaks.

1. Vaccination limited to the contacts and immediate surroundings of patient. This attitude may be followed in the case the introduction of infection was spotted immediately, so a short period elapsed and the patient movements were rather limited. This system should be further backed by highly organized health services and accurate appraisal of immunity status of population under question. Introduction of variola in several countries of Europe has been contained by this way.

2. On the other hand importation of infection to crowded communities with lower standard of Health Services, lower immunity level, or in the case the implementation of containment measures were delayed due to the misdiagnosis, the vaccination of other residents in the area and special groups at risk should be started. This goes especially for rural areas but also for town communities where it may be found useful to organize vaccination for the whole segment of the town or the entire population of the town. Examples from Africa, Mediaterranean region and from Europe where the spread of infection was impeded by mass vaccination campaign may be quoted in favour of this method. Team work based on door to door visit combined with collecting points will be probably method of choice in most countries under question. In order to protect contacts who were either found in their late incubation period or cannot be vaccinated because of some contra indications, hyperimmune gamaglobulin or methiasonone should be in stock in some limited quantity.

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An integral part of vaccination is the reading of post-vaccination reactions which should be made in all contacts belonging to inner and outer ring on 6th to 8th day and second vaccination should be performed in the case of equivocal reaction. The evaluation of coverage and potency of the vaccine used during the mass vaccination of residents living in the affected area assessment methods similar to those used in regular programme will provide satisfactory and representative results.

Repeated visits paid to the affected locality by surveillance team are essential for some cases may occur among those vaccinated in their last third of incubation period. In detection of residual cases all health personnel should lend their hand. This goes especially for the malaria workers as they are supposed to visit all houses in their respective area within a relatively short period the persons with fever being their main concern.

Disinfection : Procedures as worked out by WHO expert committee gives clear guidance in this respect. The autoclaving of all material eligible for this method, fumigation of rooms with 40% solution of formalin in water containing 10% methanol burning down of all items not possible to be sterilized by other method including vacuumed dust from rooms should be carried out. However, it should be mentioned that this are the methods which mostly matched the conditions of hospitals but are of little use in the field. On the ground of experience one would be glad to see the people in rural areas at least to dust their beddings and to expose them to the sun.

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Health education should not be forgotten during the containment activities. It has to ensure good public response to all steps taken especially vaccination and surveillance. Permanent flow of information from radio, newspapers, posters, loudspeakers etc. should be every day reminder of existing danger and must not let the people to grow indifferent to the fact of occurence of smallpox.

Organisation and administrative aspects of surveillance and containment activities : As the occurence of smallpox in non-endemic country is not a matter of every day there appears to be good reason to centralized this highly qualified clinical-epidemiological work as much as possible. For that purpose a panel consisting of cliniciars, epidemiologists and laboratory advisers should be established. Headed by Medical Officer, Public Health, Ministry of Health this body would be incharge of planning and execution of the above activities.

Their work should be assisted by competent laboratory which should be made responsible for the examination of smallpox specimens collected in the field. If there are not facilities for full scale examination there should be personnel trained and able to perform simple screening diagnostic tests such as microscopic examination of stained smars gel diffusion test and isolation of virus by cultivation on the chorionallantoic membrane of the embryonated egg which does not require special equipment. At any rate the standardised technique as prepared by WHO should be followed.

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Further arrangement for isolation, transportation of patients and final dis-infection of infected material should be planned well in advance in all aspects to avoid any delay in the case of emergency.

Surveillance and containment team headed by epidemiologist, a member of the adviser's panel should be organized and personnel e.g. vaccinators and Sanitary Inspectors be trained in multipuncture technique, jet gun operation, reading of postvaccination reactions, technique of assessment and methodology of epidemiological investigation as well.

Team of 6 Vaccinators employing jet guns together with 3 Sanitary Inspectors should be able to investigate and contain localized outbreak during period not exceeding 4-6 days depending of course on local geographical and other conditions. In the case of large outbreak assistance of local staff may be sought.

Summary :

Containment and surveillance activities in connection with outbreak originating from imported case of smallpox in non-endemic country are discussed. Main problem areas such as diagnosis of smallpox, channel of communication, epidemiologic investigation and containment measures are pointed out together with administrative and organisation aspects which should be considered when preparing the plan of action for the above activities.

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