

Diarrhoeal diseases in the Gelukspan Health Ward 1983-84

Paulo Ferrinho

Part three of a three-part article.

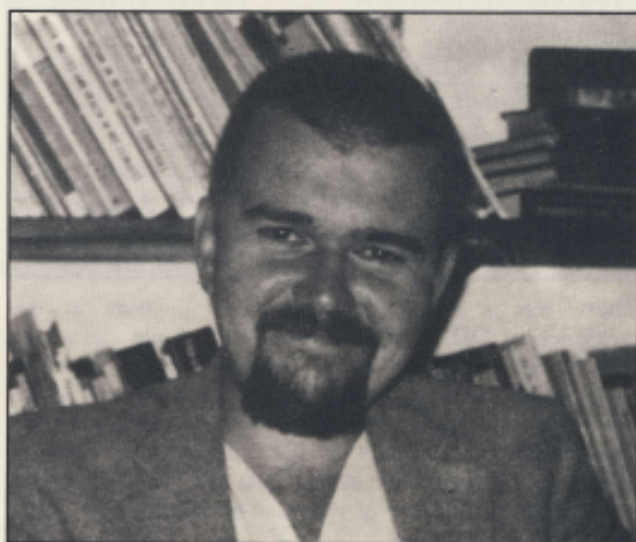
Summary

This article is divided into 3 parts. In Part I a general introduction to the Health Services in the Gelukspan District is given with the reasons for such a survey. The data from children admitted with diarrhoeal diseases to our ward over a period of 7 months are analysed, with regard to seasonal, age, sexual and nutritional factors as well as mortality. Then the 70 questionnaires completed with the caretakers of the above children are discussed and analysed.

Part II represents the results of a community survey on diarrhoeal diseases conducted in 1984, including the attitudes and knowledge of the caretakers concerning this disease and aspects of domestic hygiene.

In Part III the findings are discussed in relation to other surveys in trying to understand what is happening regarding diarrhoeal diseases in the Gelukspan area. Some conclusions and recommendations are made.

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Curriculum Vitae

Paulo Ferrinho was born in Mozambique and went to school in Maputo. He studied at UCT where he obtained the MB ChB in 1980. He did his internship at Groote Schuur Hospital in 1981 and has been at Gelukspan Hospital since 1982. Dr Ferrinho's basic interest lies in Primary Health Care with the emphasis on psychiatric and maternal and child health care.

KEYWORDS: Diarrhea, Infantile; Developing Countries; Health Education; Delivery of Health Care; Dehydration; Fluid Therapy; Malnutrition.

ABBREVIATIONS

- ANC — Ante-Natal Clinics
- BF — Breast-feeding
- DD — Diarrhoeal Diseases
- FP — Family Planning
- HDD — Household where at least one of the underfive children has had diarrhoea over the study period.
- NDD — Households where none of the underfive children had diarrhoea over the study period.
- ORS — Oral rehydration solution
- PNC — Postnatal Clinic
- SSS — Salt-Sugar Solution
- UFC — Underfive children

DISCUSSION

In this discussion we will try to integrate the data from our study and to understand it. We will review some literature, where relevant, and we will make use of data from the previous surveys conducted in our health ward. We will concentrate on the decreased incidence and the mortality of DD in our district.

THE INCIDENCE OF DIARRHOEA

Table 4.1 summarizes the situation in our district and the changing picture concerning the incidence of DD and its mortality between 1980 and now (1983).

	1980(2)	1983
Total underfive population	10 311	11 303
Rate of DD (UFC)	49,0%	25,8%
Total number of UFC with DD	5 052	2 916
Case fatality rate	5,4%	3,0%
Total number of UFC that died with DD	273	87
Death rate of UFC due to DD per 1 000 UFC	26	8
DD deaths as % of all UFC deaths	22,0%	41,2%

There was a sharp decrease over 3 years in the incidence of DD. We were unable to obtain data with reliable figures indicating the incidence of DD in other rural areas of RSA. Most of the data in the world literature concerns surveys conducted in the late 1970's and therefore our data is not comparable. Another aspect is that we look at children that had diarrhoea and not at the number of episodes of diarrhoea.

How can we explain such a significant decrease in the incidence of DD? It is known that some factors do have an impact in the incidence of diarrhoeal diseases: breast-feeding, weaning practices, the nutritional status of the underfive population, measles immunization, water and domestic hygiene. We will look at each of these aspects in detail.

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BREAST-FEEDING AND WEANING PRACTICES

Several studies have demonstrated a lower incidence of diarrhoea in breast-fed infants than in partially breast-fed or artificially fed infants during the first months of life^{12,13}. It is therefore not surprising to find that when weaning is early the incidence of diarrhoeal diseases tends to peak early; when it is prolonged, the reverse is true¹⁴.

In our health ward at least 87% of our children are breast-fed for some time and this was true for 1979 as it is for 1984¹⁵. More worrisome is the fact mentioned by Knaap and Bekkers¹ that 36% of the children under

6 years in their sample had been weaned before the age of four months.

Our own figures (Table 3.3 in Part 2) about mothers that ever breast-fed their babies (rather than babies that were breast-fed at the time) show a less favourable picture — only about 60% of the mothers ever breast-fed their babies. The limitations of the way in which the question was asked have already been discussed and therefore our numbers may not be representative. What may be more important is that in HDD, 55% of the mothers admitted to breast-feeding their children vs. 61% in NDD; although the difference is not significant, it is suggestive ($0,5 > p > 0,1$). Still more significant is the fact that of all children admitted with caretakers, only 7% (under five years) or 19,2% (under 6 months) were exclusively breast-fed.

Table 4.3 compares the rate of breast-feeding in DD of children admitted with caretakers to our wards, with the rate of breast-feeding children in the same age groups in the district.

AGE	DISTRICT 5	WARD
12-24 months	62,8%	36,3%
> 24 months	11,9%	0%

The above numbers could either reflect the protective role of breast-feeding which some authors deny after the age of 6-8 months¹³, or could reflect other factors association with non-breast-feeding eg absence of the mother on seasonal work, having the child under the care of an inexperienced caretaker, our data does not allow further explanation of this matter.

The picture that emerges is therefore that the percentage of children breast-fed now is the same as in 1980; in the district the same percentage of mothers in HDD as in NDD breast-fed their children; a significant proportion of mothers stop breast-feeding very early; and DD appears to select these children, or at least these children more frequently have DD that need hospital treatment.

NUTRITIONAL STATUS

Diarrhoea and malnutrition are associated in a two-way cause and effect relationship; diarrhoea causes and aggravates malnutrition and malnutrition predisposes children to a diarrhoea, which is more common and severe in malnourished children than in their well-nourished counterparts^{15,16,17,18,20,23,71,72,73,74,75,76,77,78}.

Our results in Graph 1-3 in Part 1 show that the average weight of children admitted with diarrhoeal diseases is consistently lower than the average weight of our district children. Also shown (Table 1.2 in Part 1) is the association between malnutrition and mortality. Surveys conducted over the years in our health ward show that the prevalence of weight for height of less than 80% of the Harvard mean was 33% in 1979¹ and this has dropped to 1% in 1983⁵ after an active nutrition intervention program⁶.

We believe that the above aspect is possibly the main contributing factor for the decreased incidence of DD in the district, which in return further contributed to the decrease in the amount of malnutrition.

MEASLES IMMUNIZATION

The traditional healers in our health ward recognize measles as one of the causes of diarrhoea and some of the remedies used for the treatment of DD are equally used for the treatment of measles. This association is also recognized in the medical literature and has been extensively studied^{22,24,25,26,27}. Some of the authors have pointed to the importance and the likely impact of measles immunization in reducing the incidence and mortality of DD in underfive children²⁷. The primary health care programme in our district has had a significant impact on the measles immunization status of our underfive population. While in 1980 only 56% of the preschool population had had one or two measles vaccinations, in the last survey conducted in our district in 1984 the number had increased to 82,4%. This level of immunization would prevent 1,3% to 3,8% of all diarrhoeal episodes and 12 to 25% of all diarrhoeal deaths²⁷.

ASPECTS OF DOMESTIC HYGIENE

Water

The classical view of diarrhoeal diseases transmission through faecally contaminated drinking water has been modified and now it seems more probable that in underdeveloped areas most of diarrhoeal episodes are due to anus-hand-mouth spread²⁹. This is consistent with some reports that the contamination of drinking water does not correlate with the rate of intestinal infections or DD in the community^{12,28,79}, although other studies seem to show a relationship between water quality and DD³⁰. What all the evidence seems to point at, is that in the presence of poor hygienic practices there seems to be little or no benefit in improving water quality. What seems more important is water quantity, the amount of water available for personal and domestic hygiene and the evidence seems to indicate that modest increases in water availability may have a significant impact on the incidence of diarrhoeal diseases^{31,33,34}. In our district no recent studies have been

We found it more important to improve the quantity of water than to improve the quality.

conducted on water quality except for the one in 1981 by Van As and Kasbergen² and this study failed to show any relationship between water contamination of the source and diarrhoeal diseases. Another way of assessing water quality, and maybe a more important way as it assesses water quality and handling before domestic consumption, would be to ask about boiling of water before consumption. In the study already mentioned in 1981² it was found that the frequency of diarrhoeal episodes was related to boiling of water before consumption. In households where there was one DD episode, 73% of the families were not boiling water and this increased to 85%, 91% and 100% respectively for 2, 3 and 4 or more episodes per household. In the same study it was found that between 61% and 82% of all the families (varied from village to village) were not boiling their water before consuming it. In this study we fail to demonstrate any difference between NDD and HDD concerning the practice of boiling water before consuming it. What is more interesting is that while in our community 70% of all the households boil water before consuming it, in

cases of DD admitted to the hospital only 50% of those admitted with caretakers were routinely boiling water before consumption. The significance of this observation, if any, is not clear but it seems to point to the fact that boiling of water might protect against the most severe forms of DD, those requiring hospital admission.

Diarrhoea causes and aggravates malnutrition, and malnutrition predisposes children to diarrhoea.

Concerning water availability in 1981², 100% of all the households in a random sample were within 500 metres of the nearest water source which in the majority of cases was a public borehole (underground water). Since then a few more boreholes have been drilled. This distance seems to be adequate as compared to other third world rural areas³¹. A worrying finding of the 1981 report² was that in summer 35% of the sample and in winter 45%, admitted to water shortage, particularly in association with wind-dependent water supplies, in the same study 22% of the boreholes were found to be out of order. The situation at the moment is not known.

Pit latrines

Disposal of faecal material is important in the control of diarrhoeal disease, but if not properly implemented it can have a deleterious effect. In our district, over 90% of all households admitted to the availability of latrines. Their use was not assessed but it is my impression that there is room for great improvements in the building (siting, for example) and hygienic use (hand washing) of latrines in our district. There was no difference between the percentage of HDD and NDD that had pit latrines. Van As and Kasbergen indicate that contamination of underground water seems to be a problem in our district².

Other

Other aspects may play a significant rôle in the epidemiology and incidence of diarrhoeal diseases. Some aspects of knowledge (for example, boiling of water) have already been discussed, but what is the impact of educational levels and individual knowledge, attitudes and practices with regard to household hygiene and the hygienic management of children on the transmission cycle? A Colombian study shows that a mother's perception of malnutrition in her child, the age of the mother, the house appearance and the mother's knowledge were important predictive variables concerning the prevalence of diarrhoeal disease in the two weeks preceding the study⁸. It is possible, I believe, that this

DD is a learning experience to the mothers concerned.

increase in knowledge might be due to an increased contact with diarrhoea in the period preceding the two weeks of study period. If that was the case the above findings will be in line with our own findings, that mothers of children from HDD out-performed mothers of children belonging to NDD, in the questions in our community survey,

concerned with knowledge and attitudes (scores of 61,7% vs 55,6%), which once more illustrates that DD is a learning experience to the mothers concerned.

Other studies seem to indicate that high educational achievements are associated with poor health practices^{37,38}. This was not found in this study. We find that educational levels in our survey are not significantly different from educational levels of caretakers three years ago¹. The average education of caretakers belonging to HDD was the same as that of caretakers belonging to NDD. We might conclude that despite the fact that mother-education correlates with the malnutrition of the child¹ it does not appear to relate to the incidence of DD in the district.

THE MORTALITY OF DIARRHOEA

Diarrhoeal diseases have a significant impact on childhood morbidity and mortality. Even in developed countries gastroenteritis is still among the ten leading causes of death for children under 5 years of age³⁹. In Africa the average UFC mortality due to DD is 13,8 per 1 000⁴¹ (range 8,9±5,7 to 76,8±19,3) deaths per 1 000 UFC⁴². In South African black children in 1970 the UFC mortality due to gastroenteritis was 12,5 per 1 000⁴⁰ being 9 to 32 times that of white children^{70,61}. The mortality rate varies between inpatient and outpatient reports but the mortality for inpatient black children remains very high between 23,0% in some urban areas⁷⁰ and over 40% in some rural areas (Dr M. Hlalele, personal communication, February 1985). The picture in our district seems to be better, not only in relation to our recent past but also in relation to the rest of Africa. By consulting Table 4.1 again we see that not only has the incidence of DD decreased but there was also a significant reduction in diarrhoeal deaths. The

DD has a significant impact on childhood morbidity and mortality.

case fatality rate for hospital inpatients has been reduced from 12,2% in 1982 to 6,7% in 1983 and 5,1% during the present study period. Still, very significant is that while in 1980 DD accounted for only 22,0% of all underfive deaths, in 1983/4 they accounted for 41,2%. This means that aggressive attempts at curbing DD mortality will have a significant impact in underfive mortality.

What are the reasons for these improvements? Some of the reasons such as improved nutritional status and improved immunization status against measles have already been discussed. Some factors such as age of child, are not amenable to intervention (most studies report the highest mortalities for children under 1 year of age). But if we consider that children born just before and at the height of "diarrhoea season" have the lowest death rates for diarrhoeal diseases during the first year of life (because of exclusive breast feeding during this period)¹⁴ then we might have good reason for rejoicing in the fact that the month of September is the one with the highest midwifery activity in our district, (this is a result of the fact that migrant labourers return home over Christmas). If we could encourage these mothers to exclusively breast-feed

their children for 5-6 months following delivery then most of these children together with the ones born in the following months will be taken over the "diarrhoeal season" with a lower mortality rate. The management of intercurrent infection, the distance from the health centre, the home management of diarrhoea and the skill of the health workers are all important aspects that require some detailed discussion.

Intercurrent infections

Diarrhoea in a child is no more than a presenting symptom of a whole range of conditions. Our results in Table 1.2 in Part 1 suggest the important contributions of parenteral infections to the mortality of children with diarrhoea. Our own experience at postmortems of these unfortunate cases shows that by far the commonest finding in fatal cases of DD is bronchopneumonia. This has been recognized in at least another report: Greenhough reports from Bangladesh that respiratory diseases, are by far the most common complications and cause of fatality in the diarrhoeal patients treated in Matlab Hospital⁴³. The significance of this is that a further reduction in DD mortality will, to a large extent, depend on the prevention and proper management of respiratory tract infections. This brings us to an important and controversial aspect in the management of DD: the use of antibiotics. The literature in general tries to play down its use and recognizes very few indications for them^{64, 69, 70, 50}. My experience and at least one other report⁶¹ are not in agreement with the above-mentioned literature. As already discussed, diarrhoeal diseases not infrequently are accompanied by systemic infections that are often fatal. The need therefore arises to recognize that although the indications for the use of antibiotics in gastroenteritis is limited in DD, the indications should be liberal and should read as follows:-

1. Severe malnutrition
2. Pus or red cells in the stools
3. Chronic or current diarrhoea (*Giardia lamblia* being the commonest cause)
4. Obvious bacterial parenteral infections
5. Recognizable pathogens — cholera, shigella, giardiasis, campylobacter jejuni
6. Diarrhoea associated with measles⁷⁰

No harm is done and many lives will be saved.

Management of DD by the caretakers at home

Home management of DD will depend on cultural factors, previous experiences, educational levels, accessibility of the health services and the success of these same health services⁴⁵. The use of self-medication must definitely have an impact on the mortality of DD as it might unduly delay the presentation to the adequate health centre. Studies from other countries and from other cultures in SA indicate a high rate of medication at home before attending a health centre^{15,34}. A study conducted amongst semi-urbanized Tswanas appears to indicate that home medication for DD is not commonly practiced⁶⁰.

The evidence of our own survey is somewhat conflicting: about 15% of the respondents in the community survey mentioned that they would attempt treating DD themselves before looking for further help, but this contrasts with the fact that over 60% of the respondents to

the same questionnaire mentioned that they would give an enema to their children if they had gotten diarrhoea. Three interpretations are possible: 1st, that more respondents attempt self-medication but they do not admit to it; second, that an enema is such a common household treatment that it is not perceived as self-medication; and finally, that the respondents that replied "yes" to the question "would you give an enema to your child in case of DD?" were mentioning the fact that they do not object to the use of enemas rather than admitting to its use. In Part 2 of this paper we mentioned that the great majority of our

DD in a child is no more than a presenting symptom of a whole range of conditions.

caretakers of children admitted with DD (84,3%) admitted to the use of some home remedy for DD before admission (very few mentioned enemas). The reason for this high percentage could be that admission rates are highest among those that first attempt home treatment.

This is not to say that home treatment is wrong: on the contrary. Nowadays we actively try to promote the use of oral therapy for diarrhoea. To be effective oral therapy should be available at the household level, should have an acceptable composition, should be given frequently enough, should be complemented by dietary manipulation and should not delay referral to the health centre once the danger signs are there. Oral therapy has proved its worth in preventing dehydration⁴⁷ reducing hospitalization^{48,49,50,51,52,53,54} and decreasing the case mortality rate.

For the past years we have been promoting an incomplete solution prepared by adding 8 teaspoons of sugar and one teaspoon of salt to one litre of water, to be used at the household level for the prevention of dehydration. Sugar and salt are almost universally available and in promoting this type of solution special attention must be paid to the measuring container. The risk of too much sodium in the solution precipitating hypernatraemia is to a large extent a theoretical consideration in our children as it is extremely rare in our population.

As in other developing countries^{55,56} hyponatraemia appears to be the main problem and it is a serious factor to be considered as it is directly related to the degree of malnutrition and can be associated with high mortality rates⁵². How this data might apply to us is not clear: all our deaths occurred in isonatremic children.

Absence of potassium in the incomplete solution is a more real problem as we can see from Table 1.1 in Part 1, where 40% of all the children having received ORS before admission were hypokalaemic (K <3,5) as compared to 21% of those that did not receive the incomplete formula at home. The mortality rate of the group receiving the

incomplete formula was 1/2 of those not receiving any formula at all but figures are too small to take this further. What warrants some attention is the fact that the only child amongst those that received ORS before admission that died following admission had a dehydration of 10% and a potassium of 1,8mmol/l. Studies conducted somewhere else also revealed the same problem⁵⁵. A deficiency of our study is that we did not enquire about dietary supplements rich in potassium, the time between onset of diarrhoea and admission is not known, the electrolytes were checked at different intervals from the time of admission and, in some cases, the children had already had intravenous fluids. It appears that, in the absence of bicarbonate, correction of acidosis will be slower in adults; this aspect has not been studied in children but I personally believe that by preventing the onset of dehydration by the use of incomplete solution we will be preventing most cases of acidosis. It is most important to emphasize that the earlier the ORS is given, in an episode of diarrhoea the less important its precise composition becomes, because the body's mechanisms can make the necessary homeostatic adjustments⁵⁵.

Most of the deaths due to DD occur during the first year; teaching about ORS should start during ANC visits.

Puzzling and distressing is the fact that the percentage of dehydrated children on admission was the same in the group that received ORS at home and the group that did not receive it. We might be tempted to attribute this apparent failure to the use of sucrose rather than glucose if it was not for the abundant literature that proves its efficiency and, except for minor side effects, in most studies no significant differences were noted when glucose is replaced by sucrose^{57,58,59,60,61}. The most likely reason for this failure is inadequate health education either with resultant infrequent use of the SSS or failure to recognize the danger signs that warrant immediate attendance of the clinic (only 1% of the respondents in the field survey knew at least 2 signs and symptoms of dehydration).

It is still encouraging to find that 23% of caretakers of children that had diarrhoea over the past year knew how to prepare SSS. It is discouraging to see this percentage drop to 12% in caretakers that look after children that did not have DD over the past year. We cannot compare these figures to previous figures but in 1982³ in reply to the question what sort of advice the caretaker could remember from our health workers, less than 4% of the respondents mentioned SSS. This knowledge is not related to availability of a clinic in the village, type of caretaker, age of caretaker or attitude of the mother to breast-feeding. Of the respondents knowing about ORS a higher percentage recognised death and dehydration as complications of diarrhoeal diseases. It also seems that although the level of education does not have any impact in the incidence of DD it might play a rôle in the knowledge of ORS: 30% of HDD caretakers have never been to school, this drops to 26% in cases of caretakers from NDD and further drops to 16% in cases of caretakers that know how to prepare ORS.

Note: Corrections received for Diarrhoeal Diseases ... part two. Appendix V, 4th column from the left, line for Post Matric percentage should read 1,1% instead of 11,1%. Reference 8 should read: Bertrand WE, Walman BF. Maternal knowledge, attitudes and practice as predictors of diarrhoeal disease in young children. *Int J Epidemiol* 1983; 12: 205-10.

The last aspect in home management to be considered here is nutritional management. The importance of this aspect is obvious as can be seen from the discussion carried on the relation of diarrhoea to malnutrition. The fact that 55,7% of all caretakers practiced some sort of manipulation of their children's diet in cases of children admitted with DD is an important factor. The importance of this aspect is further emphasized by the fact that 31% of 120 children admitted for the first 4 months of 1982 in the nutrition rehabilitation ward of our hospital had chronic or relapsing diarrhoea³. One fifth of the caretakers admitted with our children to the diarrhoea ward still admit to the practice of starvation. In the district survey only 8% said that food should be withheld from children with diarrhoea.

Gastro-enteritis is still among the ten leading causes of death for children under five years.

It thus appears that children on whom starvation was practised are overrepresented in our hospital sample as expected. Less than 1/3 of the caretakers in the district recommended that breast-feeding should be stopped during a diarrhoeal episode. These figures and the association, shown in our district, of diarrhoea with malnutrition and hypokalaemia points again to the fact that this is a very important aspect not only in diarrhoeal mortality but also in the prevention of malnutrition.

The skills of the health workers

The skills of the health workers are important not only in the field of treatment of diarrhoea but, above all, in their abilities to convey the message of ORS and nutritional management to the mothers of UF children. This is the most important skill needed by our primary health workers and not the easiest to acquire or to teach⁶.

In 1983 we carried out an assessment of the knowledge of our clinic nurses concerning the management of diarrhoeal diseases. Twelve nurses replied and of these, all know how to diagnose dehydration but only 25% knew how to differentiate mild from severe dehydration. Thirty four percent (34%) did not know how to prepare SS. Eleven (92%) were not clear on the sort of advice to be given to the mothers of children with diarrhoeal disease. Only two were clear on the adequate treatment for mild dehydration. Most recognized the need for IV rehydration in severe dehydration but only one admitted to having the skill to establish an IV line. In reaction to this inadequate preparation of our nurses, it was decided to standardize management of diarrhoeal diseases and for this a flow chart was drawn up, spelling out the diagnosis and management of different degrees of dehydration and what sort of health education to give in diarrhoeal diseases.

CONCLUSIONS AND RECOMMENDATIONS

1. The picture that emerges from this survey is an optimistic one. As it can be seen in Table 4.1 there is a decrease in the incidence of diarrhoeal diseases both in relative and absolute numbers and the same applies for the mortality rate. Many of the factors that emerged from our study support the findings of other studies and they will not be mentioned further.

2. There is still room for improvement concerning breast-feeding practices.

3. A very important "wrong" practice to be corrected is the giving of enemas to children with DD.

4. Starvation therapy is uncommon. Our caretakers have the right attitude to the giving of fluids and food during the episode. They don't, however, have the right knowledge.

5. Emphasizing the complications and the seriousness of DD might encourage the mothers to adopt the health behaviour that we believe to be more correct.

6. Our health services are widely accepted. The only way to make them readily accessible to the population will be by implementing the policy of having primary health care workers with rudimentary but meaningful training at the village level.

7. Boiling of water before consumption is widely practiced, but it appears to have no impact in the incidence of DD; this points to the fact that clean water must go together with appropriate hygienic practices at home.

8. There is potential for expansion of our OR programme but special attention will have to be paid to the measuring unit being used.

9. The fact that most of our deaths due to DD occur during the first year of life points to the need to start teaching about ORS during ANC visits. The rapid expansion of our health education programme will depend on the adequate use of our limited resources. Songs should be emphasized; the opportunity to promote them through the radio would have, we believe, a profound impact on the education of the population. The use of posters is limited by our inability to reproduce the few we developed. The need to revise the Health Education Curriculum in our schools is obvious.

10. The maintenance of water sources in our district is an important aspect of health. To keep communication channels open and for better co-ordination of efforts I would suggest that representatives of the water maintenance services should be invited to participate in our monthly Regional Health meetings. The emphasis of our water policy should be on quantity rather than quality.

11. When carrying out studies of a similar nature it is essential that while questioning the respondents, more time should be spent in clarifying their definition of diarrhoea.

12. Our research priorities in the field of DD are:

- (a) DIETARY PRACTICES IN ASSOCIATION WITH DD
- (b) APPROPRIATE TECHNOLOGIES FOR WATER AND DOMESTIC HYGIENE
- (c) HEALTH EDUCATION TECHNIQUES AND MATERIALS ABOUT DD

13. The most important conclusion to be drawn from this report is that a PRIMARY HEALTH PROJECT, wide in its scope, resulting in a decrease of malnutrition rates and a general improvement of the health status and immunization status and in better hygienic practices (eg boiling of water) is effective in reducing both the incidence and the mortality of DD.

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