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SOCIOECONOMIC DIFFERENTIALS OF DIARRHOEA MORBIDITY AND MORTALITY IN SELECTED VILLAGES OF BANGLADESH

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Abstract

Socioeconomic differentials of diarrhoea episodes, hospitalizations and fatalities were investigated in 11 selected villages of the Matlab study area in Bangladesh. Four data sources were used: (i) a UNICEF-CRL (Cholera Research Laboratory, now ICDDR,B) collaborative study of the impact of hand-pumped tubewells on diarrhoea episodes; (ii) hospitalized diarrhoea patients; and (iii) field diarrhoea deaths of 1975. These were linked with socioeconomic and demographic data from a 1974 ICDDR,B census. Socioeconomic status showed a significant positive relationship with the diarrhoea episode rate, and a negative relationship with the mortality rate. The relationship between socioeconomic status and the diarrhoea hospitalization rate was inconsistent. Possible attitude differences toward the disease symptoms in various socioeconomic subgroups should be recognized, before designing studies to estimate diarrhoeal disease prevalence and control.

Key words: Diarrhoea; Mortality; Morbidity; Socioeconomic Conditions.

Introduction

While much is known of the relationship of such characteristics as age and sex to mortality, few studies have been done relating socioeconomic status to mortality. Thus, only a few investigators have demonstrated mortality differences by education, occupation, housing type, land holding and income (1-3). Little is known about the relationship of socioeconomic status to morbidity.

Diarrhoeal diseases cause considerable morbidity and mortality, especially in developing country infants and children (4-6). However, the socioeconomic differentials of these major killer diseases remain unknown. In rural Bangladesh, nearly 15 percent of all deaths in recent years were due to diarrhoeal diseases (7-9). This paper examines differentials in diarrhoea episodes, hospitalizations and mortality rates, according to patients' ages and education levels, as well as the occupational categories of the heads of households, and dwelling ownership and type.

Materials and methods

This study used four data sources for a population of 15,773, living in 11 of 12 selected villages of the Matlab study area, Comilla District, Bangladesh. The data were: (i) a UNICEF-CRL (Cholera Research Laboratory, now ICDDR,B) collaborative study of the impact of hand-pumped tubewells on diarrhoeal episodes; (ii) records of diarrhoea patients hospitalized at the Matlab field treatment center and (iii) field diarrhoea death reports for 1975. These were linked with socioeconomic data collected by a 1974 ICDDR,B census.

For an entire year beginning in January 1975, field workers of the UNICEF-CRL tubewell study visited every household weekly, to ask a responsible adult about diarrhoea episodes occurring that day as well as during the previous week, and about how many days the diarrhoea had lasted. Diarrhoea was defined as two or more watery stools a day, with or without blood or mucus. A diarrhoea episode was defined as diarrhoea for at least one day, following a minimum of two days of normal stool. The details of this study were reported earlier (10).

Information about diarrhoea hospitalizations was obtained from the diarrhoeal disease patient registers for 1975, kept by the Matlab field treatment center. Data related to 1975 diarrhoea deaths were obtained from the death reports, which are part of a longitudinal Demographic Surveillance System (DSS) the CRL/ICDDR,B has been main-

taining for the Matlab area since 1966. A description of this system's methods and procedures was published previously (11).

Socioeconomic data for the study villages were collected in 1974, as part of a larger periodic census. At that time, every individual, household and village was identified by a unique numbering system built into the census. The details of the census operation and the socioeconomic individual and household data collection methodology already have been reported (12). Socioeconomic status was defined according to the educational levels and occupations of the heads of households, as well as by dwelling type and ownership. Since a similar age structure was found for all socioeconomic subgroups, it was thought unnecessary to cross-tabulate age groups with socioeconomic status, in order to calculate diarrhoea episodes, hospitalizations and mortality rates. In addition, data on type of practitioners consulted prior to death were analyzed.

Results

The diarrhoea episode hospitalization and mortality rates by age group are presented in Table I. A very high episode rate is seen in age group 0-4, with much lower, decreasing rates for ages 5-14 and 45+, and a very low rate for ages 15-44. The 0-4 age group accounted for a very high hospitalization rate, followed by much lower, gradually decreasing rates for age groups 5-14, 15-44 and 45+. The highest mortality rate was estimated in age group 45+, with a slightly lower rate for the 0-4 group and very low rates for ages 5-14 and 15-44.

Diarrhoea episodes, hospitalizations and mortality rates according to head of households' education are shown in Table II. The diarrhoea episode rate in households whose heads had 7+years of education was higher than in both those whose heads had 1-6 years education or no education – a statistically significant ($p < .001$)

TABLE I – DIARRHOEA EPISODES, HOSPITALIZATION AND MORTALITY ACCORDING TO AGE, MATLAB, BANGLADESH

Age (years)	Population	Rate per 1,000 Population		
		Episodes	Hospitalization	Mortality
0–4	2,319	2,082.8	60.4	12.5
5–14	4,953	911.6	9.3	2.6
15–44	6,247	342.2	8.5	0.8
45+	2,254	880.2	7.5	18.6
Total	15,773	853.8	16.2	5.6

TABLE II – DIARRHOEA EPISODES, HOSPITALIZATION AND MORTALITY ACCORDING TO EDUCATION OF HOUSEHOLD HEAD, MATLAB, BANGLADESH

Education of Household head (years of schooling)	Population	Rate per 1,000 Population		
		Episodes	Hospitalization	Mortality
No schooling	9,719	860.6	15.3	5.8
1–6 years	4,354	804.8	17.9	6.0
7+ years	1,700	940.6	17.1	4.1
X^2 (df)	–	27.8(2)	1.3(2)	0.8(2)
P	–	< .001	> .05	>.05
P	–	.00001 (7+ years vs. the others)	–	–

difference. Similarly, the hospitalization rate was higher where household heads had 1-6 years and 7 + years education than where they had no education. The diarrhoea mortality rate was lower where household heads had 7 + years education, than where the head had 1-6 years or no education.

Very low diarrhoea episode rates were found in occupational category I (farm laborers, boatmen, fishermen and beggars). These rates gradually increased in occupational categories II (non-farm laborers and mill workers) and III (businessmen and service employees), and reached a very high level in occupational category IV (farmers) (Table III). As for hospitalization rates, the lowest was in occupational category I, with intermediate rates in categories III and IV, and an exceptionally high rate in category II. The hospitalization rate difference between category II versus the other three categories is statistically significant ($P < .001$). Finally, looking at diarrhoea mortality rates, a very high one was seen in occupational category I, while mortality rates decreased substantially and were nearly equal for occupational categories II, III and IV. The mortality rate difference for category I versus the other three is statistically significant ($P < .001$).

The diarrhoea episode rate was exceptionally low in households not owning tin-made dwellings, was much higher in those owning partial tin dwellings and was highest in those owning full tin dwellings (Table IV). As for the diarrhoea hospitalization rate, it was higher for owned partial and complete tin dwellings than for those who did not own tin dwellings. The hospitalization rate difference for partial tin dwellings versus the other two categories is statistically significant ($P < .01$). Finally, the diarrhoea mortality rate was very high for households not owning tin dwellings, lower for partial tin dwellings and still lower for full tin dwellings.

Discussion

This study demonstrated that children under age 5 were most affected by diarrhoea episodes, followed by age groups 5-14 and 45+. Least affected was age group 15-44. It appears that, in the early and later years of life, people are most vulnerable, largely due to a low physical resistance. Children under 5 accounted for both a very high diarrhoea hospitalization rate and for a considerably high diarrhoea mortality rate, compared

TABLE III – DIARRHOEA EPISODES, HOSPITALIZATION AND MORTALITY BY HOUSEHOLD HEADS' OCCUPATIONAL CATEGORIES, MATLAB, BANGLADESH

Occupational Category	Population	Rate per 1,000 Population		
		Episode	Hospitalization	Mortality
Category I (Farm laborer, boatman, fisherman, beggar)	4,489	710.0	12.9	9.1
Category II (Non-farm laborer, mill worker)	1,469	808.0	27.9	3.4
Category III (Businessman, service employee)	2,794	873.3	14.7	4.3
Category IV (Farmer)	7,021	947.6	16.5	4.4
X^2 (df)	—	186.0(3)	15.8(3)	13.8(3)
P	—	< .001	< .01	< .01
P	—	—	< .001 (category II vs. the others)	—
P	—	—	—	< .001 (category I vs. the others)

TABLE IV – DIARRHOEA EPISODES, HOSPITALIZATION AND MORTALITY BY OWNERSHIP OF DWELLING TYPE, MATLAB, BANGLADESH

Ownership of dwelling type	Population	Rate per 1,000 Population		
		Episodes	Hospitalization	Mortality
No tin dwelling	2,608	651.5	11.1	9.2
Partial tin dwelling	11,613	856.4	17.8	5.3
Full tin dwelling	1,552	1174.6	12.9	1.9
X^2 (df)	—	312.2(2)	7.1(2)	9.8(2)
P	—	<.001	<.05	<.01
P	—	—	<.01 (Partial tin dwelling vs. the others)	—

to age groups 5-14 and 15-44. Age group 45 + showed the lowest diarrhoea hospitalization rate and the highest diarrhoea mortality rate. Travel by younger children depends mainly on the availability of an adult or elder sibling. For elderly rural residents, transportation and distance are major barriers to both access to and utilization of health care (13).

The findings indicated that households having a higher socioeconomic status reported diarrhoea better than did those with a lower socioeconomic status. The probable reason is that people with higher socioeconomic status pay more attention to diarrhoea, as they are more aware of its consequences. Thus, persons in higher socioeconomic groups probably tend to report mild cases more promptly than do individuals of lower socioeconomic groups.

This finding suggests that possible attitude differences toward diarrhoeal disease symptoms among diverse socioeconomic subgroups should be recognized, before designing studies to estimate disease prevalence and control. It should be noted that when the number of episodes reported is suspected to be biased, case fatality and case hospitalization rates likewise are suspect. Therefore, rates presented have used only population as a denominator.

The diarrhoea hospitalization rate increased with educational status, but was not explained by either higher occupational status or ownership of a better dwelling. The educational finding was not surprising, as education is thought to be the primary determinant of whether and how quickly medical help will be sought when necessary (14, 15). Education and the demand for medical care are thought to be positively related, as the more educated usually are more aware of the availability of medical care and the attendant benefits (16).

As to the influence of occupation on hospitalization rates, there are various determining factors. Barriers to hospital access are not only financial, but also psychological, informational, social, organizational, spatial and temporal (17). For example "distance" has several components: physical distance, as well as time and money costs of travel (18). Thus, persons who enjoy relatively flexible working hours and employment conditions can afford more frequent hospital visits. For example, non-farm laborers and mill workers can afford to take some time off without losing pay, while farm laborers cannot, since they do not get a fixed salary. Another factor is relative contact with health personnel and facilities. Thus, non-farm urban workers have greater access to medical help and utilize such access far more often than do rural residents (19).

The diarrhoea hospitalization rate increased with ownership of better dwellings, but this increase was not as consistent as was the relationship to educational level. The highest hospitalization rate was seen in households enjoying mid-level socioeconomic status and owning partial

tin dwellings.

As to the diarrhoea mortality rate, it decreased consistently with higher educational and occupational status as well as with ownership of better housing. There is a positive relationship between education and health and a negative relationship between education and disability (20). Mortality consistently is higher among children residing in relatively smaller dwelling units (21). Moreover, analysis of data (not presented) from this study related to the type of treatment received prior to death, showed that only 50 percent of the deceased had received treatment, mostly in their homes. Also, higher socioeconomic status households were more prone to consult qualified allopathic physicians, while poorer socioeconomic groups showed a greater tendency to consult unqualified "medical" practitioners. The latter finding is supported by other studies done in the same area (22, 23). The practices of unqualified practitioners, who enjoy strong positions in the countryside, are known to be a health hazard (24).

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References

1. Vaidyanathan KE. Some indices of differential mortality in India. In: Vaidyanathan KE, ed. Studies on mortality in India, Tamilnadu: Gandhigram Institute of Rural Health and Family Planning, 1972:145-60 (Monograph series no. 5).
2. Chowdhury AI, Aziz KMA. Occupation: a determinant of birth and death rates in rural Bangladesh. *Rur Demogr* (Dhaka) 1974;1:12-26.
3. D'Souza S, Bhuiya A. Socioeconomic mortality differentials in a rural area of Bangladesh. *Pop Dev Rev* 1982;8:753-69.
4. Rhode JE, Northrup RS. Taking science where the diarrhoea is. In: Acute diarrhoea in childhood. Amsterdam: Elsevier, 1976:339-58 (Ciba Foundation Symposium, new series 42).
5. Walsh JA, Warren KA. Selective primary health care: an interim strategy for disease control in developing countries. *N Engl J Med* 1979;301:967-74.
6. Chen LC, Rahman M, Sarder AM. Epidemiology and causes of death among children in a rural area of Bangladesh. *Int J Epidemiol* 1980;9:25-33.
7. Chowdhury SA, Khan AH. Cause of death, 1975-1978. Noakhali: Health Research Project, 1980:14.
8. Chowdhury MK, Razzaque A, Becker S, Sarder AM, D'Souza S. Demographic surveillance system – Matlab. Volume 9. Vital events and migration 1979. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh 1982: 40-1 (ICDDR,B Scientific Report No. 56).
9. Chowdhury MK, Razzaque A, Mostafa G, Sarder AM, D'Souza S. Demographic surveillance system – Matlab. Volume 10. Vital events and migration 1980. Dhaka: International Centre for Diarrhoeal Disease Research, Bangladesh, 1982: 43-4 (ICDDR,B Scientific Report No. 58).
10. Curlin GT, Aziz KMA, Khan MR. The influence of drinking tubewell water on diarrhoea rates in Matlab thana, Bangladesh. Dacca: Cholera Research Laboratory, 1977:4-6 (CRL working paper no. 1).
11. Ruzicka LT, Chowdhury AKMA. Demographic surveillance system – Matlab. Volume 1. Methods and procedures. Dacca: Cholera Research Laboratory, 1978:7-11 (CRL scientific report no. 9).
12. Ruzicka LT, Chowdhury AKMA. Demographic surveillance system – Matlab. Volume 2. Census 1974. Dacca: Cholera Research Laboratory, 1978: 2-9 (CRL scientific report no. 10).
13. Stock R. Distance and the utilization of health facilities in rural Nigeria. *Soc Sci Med* 1983; 17:563-70.
14. Luft HS, Hershey JC, Morrell J. Factors affecting the use of physician services in a rural community. *Am J Public Health* 1976;66:865-71.
15. Okafor SI. Factors affecting the frequency of hospital trips among a predominantly rural population. *Soc Sci Med* 1983;17:591-5.
16. Phelps CE, Newhouse JP. Coinsurance, the price of time; and the demand for medical services. *Rev Econ Stat* 1974;56:334-42.
17. Donabedian A. Models for organizing the delivery of personal health services and criteria for evaluating them. *Milbank Mem Fund Q* 1972;50:103-54.
18. Acton JP. Nonmonetary factors in the demand for medical services: some empirical evidence.

J Pol Econ 1975;83:595-614.
19. Andersen R. Health service use: national trends and variations 1953-1971. Rockville, Md.: U.S. Health Services and Mental Health Administration, 1972. 57p. (DHEW publication no. (HSM) 73-3004).
20. Grossman M. The correlation between health and schooling. In: Terleckyj NJ, ed. Household production & consumption. New York: Columbia University Press, 1975:146-211.
21. Chen LC, Chowdhury A, Huffman SL. Anthropometric assessment of energy-protein malnutrition and subsequent risk of mortality among preschool aged children. *Am J Clin Nutr* 1980; 33:1836-45.
22. Aziz KMA. Present trends in medical consultation prior to death in rural Bangladesh. *Bangladesh Med J* 1977;6:53-8.
23. Lindenbaum S. The influence of maternal education on infant and child mortality in Bangladesh (In press, 1984).
24. Ashraf A, Chowdhury S, Streefland P. Health, disease and health-care in rural Bangladesh. *Soc Sci Med* 1982;16:2041-54.