

Inequalities in Health Care Utilization for Common Illnesses Among Under- Five Children in Bangladesh

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Abstract

Large disparities in health care utilization continue to impede under-five morbidity and mortality in Bangladesh. This study investigates the inequalities in the utilization of medical treatment of fever/cough and diarrhea among children under five years of age following the analytical approach of a published base paper using a revised Bangladesh Demographic and Health Survey (BDHS) dataset. We used cross tabulations and chi-square tests to explore bivariate relationships and multivariable logistic regression to identify factors associated with treatment utilisation. Results reveal significant differences in the use of treatment for fever/cough. Younger children were more likely to receive medical care than older children and female children had lower treatment use than male children. Household SES was also important, with children from richer households more likely to have received treatment. Wide geographical differences between the administrative units also pointed to unequal access to health services. Fewer predictors were significant in the adjusted model for diarrhoea, probably because of the smaller number of cases, but socioeconomic and geographic differences were still apparent in bivariate results. Our results show that in Bangladesh, disparities in access to medical treatment for common childhood illnesses still exist and are determined by child characteristics, household economic status and geographic location. Improving access to affordable health services, especially for poor households and

underserved areas is key to reducing preventable illness and death in children.

Keywords: Bangladesh; Children; Fever and cough; Diarrhea; Health care; Medical Treatment; Socioeconomic Disparities.

JEL Classification: I12, I14, O15, R20

1. Introduction

The reduction of morbidity and mortality rate in children under-five years is the most important global public healthcare issue (Li et al., 2020). More frequent infectious diseases like the diarrheal disease and acute respiratory infections are also causes of illness and death among children, and one of the best possible ways to minimize the severe complications and deaths is timely treatment by the medically trained provider (Bush et al., 2024). The World Health Organization also reports that the appropriate and timely treatment of acute episodes of diarrhea and respiratory illnesses helps to save the lives of a significant number of children (Bush et al., 2024). Bangladesh has reported significant progress in child survival in the last decades; yet, preventable childhood diseases still remain, and use of healthcare services by the sick children is not necessarily adequate (Khanam & Hasan, 2020). To access services, the families will be faced with some barriers, including indirect costs, lack of awareness, and unavailability, which can not stop the caregiver, who will seek assistance in pharmacies, in self-medication, or in another unqualified medical expert (Khanam & Hasan, 2020; Haque and Saha, 2018).

The use of healthcare in treating childhood diseases in Bangladesh is typified by high inequality in socioeconomic and demographic domains (Khanam & Hasan, 2020). Household wealth, parental education, geographic location, child characteristics (age and sex), access to information in the media, and access to healthcare facilities are some of the factors that were identified in the previous studies as crucial determinants of whether an ailing child can get medical treatment or not (Alene et al., 2019; Khasanah et al., 2023; Hasan et al., 2023; Kagaigai et al., 2023). Despite the increased availability of the public health facilities, the accessibility of the qualified providers of care to under-five children with diseases like pneumonia and diarrhea is rather low in Bangladesh (Khanam & Hasan, 2020). Certain expenses related to medicines, diagnostic tests, and transportation may lower or postpone care seeking behavior even in situations when such services are freely accessible (Khanam and Hasan, 2020; Haque and Saha, 2018). Also, in Bangladesh, few nationally representative studies have managed to concurrently investigate numerous childhood illnesses as well as address disparities in the use of medical care. That is why, there is a definite necessity to explore the difference in healthcare access to medical care between under-five children with major health conditions like fever/cough and diarrhea using national representative data. The

research will establish the variables linked with disparities in under-five medical care access among children in Bangladesh through both bivariate and multivariate methods of analysis and, therefore, offer the evidence to guide the policy planning and intervention to minimize morbidity and mortality among under-five children (Khanam and Hasan, 2020; Khasanah et al., 2023).

2. Literature Review

The use of healthcare services in the most common diseases among children is a major health concern among low- and middle-income states in the United States and Bangladesh is no exception. The availability of quality healthcare regarding major childhood diseases such as diarrhea and acute respiratory infections are paramount to the promotion of the under-five mortality and morbidity. Neatly, however, discrepancies in healthcare provision will tend to exist due to socioeconomic and structural distinctions.

Past studies have recognized socioeconomic and structural determinants as the key predictors of treatment-seeking behavior. Richer and more educated children have a higher access to proper

medical assistance because of their higher levels of finances and education (Alene et al., 2019; Khasanah et al., 2023). Geographic inequalities also play an important part in this scenario because rural families tend to face such problems as distance to medical facilities, absence of transportation, and unqualified healthcare providers (Hasan et al., 2023).

The age and sex of the children also influence the use of health-care. They tend to be treated more at older age, and in some cases, gender differences in treatment seeking have been observed because of the sociocultural preference (Khanam and Hasan, 2020). Moreover, exposure to electronic media and the perceived distance to health facilities might also have a certain impact on the caregivers in terms of their treatment-seeking behavior (Haque and Saha, 2018).

The level of child survival rates in Bangladesh has been very successful, although there are still discrepancies in how medical treatment is used across the various socioeconomic and geographical locations. A large number of the earlier research has been done on a single disease or limited number of determinants whereas there has been a research gap on detailed studies that combined different childhood diseases. Accordingly, the research aims to examine the disparity in the use of treatment of fever/cough and diarrhea among children below five years in Bangladesh.

3. Data and Methodology

3.1 Data

In the current study, the data used was the Bangladesh Demographic and Health Survey (BDHS) 2014. The BDHS 2014 is a national representative and cross-sectional household survey that aims at gathering data on demography and health-based indicators of all the administrative divisions of Bangladesh. The data collected were between 28 June 2014 and 9 November 2014. The selected population was ever-married women aged 15-49 years, where the sample size was 17863 respondents and the response rate stood at 98. Mothers were informing about their children with their informed consent and the survey was performed following the standard procedures. The dataset is also available publicly on the DHS program, with researchers having to seek permission to use the MEASURE DHS data in research. Population of the study comprised children with the age range of less than five (0-59 months) of age years, living in the households sampled by the survey, and included in the BDHS children recode file. Two analytic sub-samples were formed depending on the recent cases of the mothers on illnesses, reported in the previous two weeks before the survey. In the analysis of fever/cough, children were taken into consideration in case they had either fever and/or cough in the reference period whereas in the analysis of diarrheal, children were taken into consideration in case they had diarrheal during the reference period. The characteristics of the children who did not have the condition of interest were not included in the relevant analysis model since the consequence variable, which was use of medical treatment, could only be important among the sick children. The design of the base study was used to determine the

determinants of treatment utilization in children experiencing certain illness conditions during the reference period because it was the sampling method.

3.2 Methodology

Two binary outcome variables were constructed to measure utilization of medical treatment for common childhood illnesses following the approach of the base paper. Among children who had fever and/or cough in the two weeks preceding the survey, the outcome variable was coded as 1 if the child received medical treatment and 0 otherwise. Similarly, among children who had diarrhea in the same period, the outcome variable was coded as 1 if the child received medical treatment and 0 otherwise. In both instances, the outcome was only defined among children who had the episode of illness during the two-week recollection and treated both those children who were not considered in the applicable analytic sub-sample as missing. We chose these explanatory variables according to the conceptual model and variables of the base paper, which consider the socio-economic status, the geography, the parental features, the child features, the household setup, and the access barrier. These were a wealth status (six quintile wealth index to the poorest to the richest), place of residence (urban/rural), administrative division, parental education level, working status of parent a mother, parental age, child age (categories of under-59 months old), child sex, number of children born, birth order, household size, number of children under-five years old in the household, access to electronic media (radio/ televised exposure), pregnancy intention with the last child (wanted then/later/no more), and perceived distance to a health facility as a barrier (The study used multivariable logistic regression models to control socioeconomic, geographic, parental, household, child, and access characteristics in trying to isolate the independent relationship between each variable and the medical treatment usage. Control variables were child characteristics (child age groups: 0-4, 5-10, 10-14, 15-19, 20-24, 25-29, 30-34, 35-39, 40-44, 45-49, 50-54, 55-59 months; child sex: male/female), maternal characteristics (mother age 20; mother education no education, primary, secondary, higher; mother occupation no formal/house Stata was used to obtain a statistical analysis. Background characteristics of the study sample were summarized at first with descriptive statistics. Cross-tabulations with frequencies and row percentages compared bivariate associations of each outcome and explanatory variables and Pearson chi-square tests were used to test statistical significance. Lastly, the multivariable logistic regression models were also established on the illness outcomes of medical treatment of

fever/cough, and medical treatment of diarrhea and odds ratios with the 95% confidence intervals were reported to calculate factors having an independent association with the utilization of treatment after adjusting by the covariates with a significance level of 0.05. Logistic regression was used to estimate the adjusted relationships between exploratory factors indicating socioeconomic status, geography, treatment utilization and characteristics of caregivers, household structure and child characteristics since the outcome variables are dichotomous. The model can be expressed as:

$$\log \left(\frac{p_i}{1 - p_i} \right) = \beta_0 + \sum_{k=1}^k \beta_k X_{ik}$$

Where,

p_i represents the probability that child i received medical treatment for the illness episode and X_{ik} denotes the k -th predictor.

The reported exponentiated coefficients were odds ratios with 95% confidence intervals to ease the interpretation process. In the fever/cough model and the diarrhea model, indicator variables were used to incorporate categorical predictors the reference category of which is distinctly defined; for instance child age, in which case the number of years between 48 and 59 months of age, was the reference pure category; the place of residence, in which case the place of residence category was the rural residence category. The likelihood-ratio chi-square test and pseudo- R^2 were used to measure model fit and the overall significance.

4. Results and Discussion

4.1 Results

Table 1 shows the pattern in the pursuance of care on two prevalent childhood diseases; fever/cough, and diarrhea against background variables that are of high significance. The table presents the number of children that have received treatment and the percentage of the children that experienced the illness against the number of the occurrence of an illness in that sub group. The percentages are thus conditional upon being sick with fever/ cough/ diarrhea. Each characteristic is reported with a p-value to show whether there is a significant difference in the treatment uptake between categories of the given characteristic.

Regarding the treatment uptake due to fever/cough, differences in the value of this treatment among different age groups of children are significant and the association was found to be

statistically significant. There is also a great difference in the level of treatment based on sex of child with males exhibiting a higher proportion of their treatment in comparison with females. The age of mother is highly correlated to fever/ cough treatment in that the younger children of mother are more liable to treatment than the older children of mother. Further to this, the occupation of the mother is also linked to treatment of fever/ cough and this has shown that employment or type of work could be a determinant in seeking care. Household structure is also significantly differentiated: having children in the household is also significantly related to the treatment of fevers and cough, which could be due to the likelihood that bigger families have fewer resources available or less caregiving time. Fever/cough treatment has a lot of relationship with wealth status and higher the wealth category, treatment is higher. Regional disparities are also realized as division is highly linked to treatment of fever/coughs as one model of geographical inequalities in the access or patterns of health-seeking. The birth order and household size too have statistically significant differences on the treatment of fever/ cough which depicts that family structure also matters in providing care to the sick children. The distance to the nearest health facility exhibits a high difference in the treatment of fever/cough, meaning that access restrictions decrease care seeking.

In the case of diarrhea, the results of differentiating among characteristics are typically less convincing than those of fever / cough in this dataset. A high number of characteristics reveal child age, sex, mother age, mother education, family size, and father education, do not exhibit a statistically significant difference in the diarrhea treatment uptake implying that the treatment proportions across these classes are similar. Nevertheless, some significant trends are still observed: the treatment differs across divisions, denoting that in the search of diarrhea treatment, geography counts. The distance factors measure of access also reveals a fluctuation in the treatment of diarrhea implying that the physical constraints of access also influence diarrhea treatment, although the magnitude of this association relies on the p-value in the tabular observation.

All in all, Table 1 suggests that the treatment of fever/cough is a stronger patterned comparatively to diarrhea treatment by socioeconomic position, geography, and household structure. The findings point to disparities in the health care access among children, especially on the wealth and location dimensions, and provide indications that access barriers like travel to healthcare facilities can be significant factors in determining whether children seeking treatment when they are sick.

Multivariable logistic regression results

Multivariable logistic regression models were estimated separately for medical treatment utilization for (i) fever/cough and (ii) diarrhea. Results are presented as odds ratios (OR) with 95% confidence intervals.

Determinants of medical treatment for fever/cough

Once covariates were controlled, there are a number of factors which were found to significantly correlate with the use of treatment to treat fever/ cough. Children in richer households were more likely to be treated than those in the poorest households (OR 1.30, $p = 0.033$), whereas the wealthiest group was not significantly different at the 5% level to the poorest one. Geographical disparities were also very high throughout divisions: relative to the reference division, children in Mymensingh were far less likely to receive treatment (OR ≈ 0.52 ; $p < 0.001$).

The use of the treatment was closely connected with child features. Female children were less likely to be given treatment than males (OR 0.83; $p = 0.010$). The age of children greatly differed with respect to treatment receipt: age categories (especially 1823 months and above) exhibited a significant gradient with infants under 6 months of age (OR 28) experiencing the highest odds of receiving treatment (the lowest odds were observed in children aged 4859 months (OR 0.50) ($p < 0.001$)).

The type of parents was also important. There was the positive association of father education: the children whose fathers had completed secondary school were more likely to receive treatment than those whose fathers had no education (OR 1.46; $p = 0.004$), the higher education was also marginally significant ($p = 0.147$). Lastly, the distance to a health facility was also a significant access barrier: the children, whose mothers said it was not a big problem, were less likely to be treated than those whose mothers said it was a big problem (OR 0.77; $p = 0.001$).

On the whole, the fever/ cough model implies widespread disparities in the use of treatment based on the wealth level, residence, age and sex of the child, education level of the father, and limitations of access.

Determinants of medical treatment for diarrhea

In case of diarrhea, the model of variables showed weaker and less accurate correlations, which revealed the smaller sample size. Geographic difference was significant as certain divisions had higher odds compared to the reference group (e.g. Khulna and Rajshahi were marginal considering $p = 0.068$ and $p = 0.067$, respectively). Mother education and education of fathers were both positive and not significant in this adjusted model but father secondary education was marginal ($p = 0.074$).

Combined, the corrected findings indicate that treatment utilization determinants are more evident and influential in the case of fever/cough, compared to diarrhea in this sample, though there seems to be geographic variation in both the result.

Table 1. Treatment for childhood illnesses according to background characteristics

Variables	Fever/Cough Treatment	Total, n (%)	Diarrhea Treatment, n (%)	Total, n (%)
Child's age in months				
0-4	201	310(64.84)	13(61.90)	21
5-9	294	401(72.32)	45(93.75)	48
10-14	284	389(73.01)	87(89.69)	97
15-19	238	351(67.81)	44(83.02)	53
20-24	249	357(69.75)	50(90.91)	55
25-29	221	336(65.77)	31(86.11)	36
30-34	174	272(63.97)	19(82.61)	23
35-39	200	314(63.69)	19(82.61)	23
40-44	15	235(65.96)	9(64.29)	14
45-49	164	273(60.07)	18(90.00)	20
50-54	167	272(61.40)	15(93.75)	16
55-59	148	269(55.02)	5(83.33)	6
Gender				
Female	517(29.59)	1747(100)	77(43.50)	177(100)
Male	688(33.87)	2031(100)	116(49.36)	235(100)
Mother's age				
Less than 20	200(38.83)	515(100)	29(43.94)	66(100)
20-34	933(31.26)	2985(100)	155(47.69)	325(100)

Above 34	72(25.90)	278(100)	9(42.86)	21(100)
Mother's Education				
No education	196(32.34)	606(100)	44(44.90)	98(100)
Primary	399(33.25)	1200(100)	57(49.57)	115(100)
Secondary	483(31.18)	1549(100)	69(51.49)	134(100)
Higher	127(30.96)	410(100)	23(35.94)	64(100)
Mother's occupation				
No formal occupation/ Housewife	728(31.04)	2345(100)	128(49.04)	261(100)
Professionals	44(28.76)	153(100)	1(16.67)	6(100)
Agriculture	311(31.82)	977(100)	48(46.15)	104(100)
Others	122(40.26)	303(100)	16(39.02)	41(100)
No. of children				
1–2	839(33.50)	2504(100)	144(48.98)	294(100)
3–5	357(28.72)	1243(100)	49(42.61)	115(100)
6 or above	9(28.12)	32(100)	0(0.00)	3(100)
No of children under 5				
1	673(32.73)	2056(100)	97(45.54)	213(100)
2	437(30.85)	1416(100)	71(48.63)	146(100)
3	95(31.67)	300(100)	25(47.17)	53(100)
Place of residence				
Rural	788(30.91)	2549(100)	129(49.24)	262(100)
Urban	417(33.85)	1229(100)	64(42.67)	150(100)
Wealth index				
Poorest	243(27.00)	900(100)	45(46.39)	97(100)
Poor	217(27.06)	802(100)	38(44.71)	85(100)
Middle	235(30.13)	780(100)	49(54.44)	90(100)
Richer	247(34.40)	718(100)	31(36.90)	84(100)
Richest	263(45.19)	582(100)	30(53.57)	56(100)
Division				
Barisal	118(29.50)	400(100)	15(38.46)	39(100)
Chittagong	211(30.10)	701(100)	30(44.12)	68(100)
Dhaka	170(29.77)	571(100)	31(52.54)	59(100)
Khulna	132(31.80)	415(100)	19(39.58)	48(100)
Rajshahi	159(32.38)	491(100)	25(51.02)	49(100)
Rangpur	151(28.01)	539(100)	22(52.38)	42(100)

Sylhet	156(37.50)	416(100)	15(31.25)	48(100)
Mymensingh	108(29.35)	368(100)	36(46.15)	78(100)
Access to electronic media				
Access	964(32.28)	2986(100)	147(45.65)	322(100)
No access	241(30.46)	792(100)	46(51.69)	89(100)
Wanted last child				
Wanted then	632(32.79)	1928(100)	96(48.48)	198(100)
Wanted later	128(30.62)	418(100)	18(43.90)	41(100)
Wanted no more	59(28.92)	204(100)	5(35.71)	14(100)
Birth order				
First	490(31.91)	1536(100)	76(46.91)	162(100)
Second	413(30.65)	1347(100)	63(43.75)	144(100)
Third	173(31.51)	549(100)	30(54.55)	55(100)
Fourth	129(37.21)	347(100)	24(47.06)	51(100)
Religion				
Muslim	1093(31.88)	3429(100)	170(46.32)	367(100)
Non-Muslim	112(32.94)	340(100)	23(51.11)	45(100)
Household size				
1–4	498(34.06)	1462(100)	81(49.39)	164(100)
5–6	413(30.03)	1375(100)	67(44.67)	150(100)
Above 6	294(31.13)	944(100)	45(46.88)	96(100)
Father's highest education				
No education	200(31.30)	639(100)	29(49.15)	59(100)
Primary	440(30.94)	1422(100)	60(47.24)	127(100)
Secondary	415(34.85)	1191(100)	69(54.33)	127(100)
Higher	143(32.05)	446(100)	34(47.22)	72(100)
Distance of the nearest health facility				
Big problem (distance)	494(35.46)	1393(100)	72(53.33)	135(100)
Not a big problem	664(30.78)	2157(100)	121(43.52)	278(100)

Source: Bangladesh Demographic and Health Surveys Data (2018)

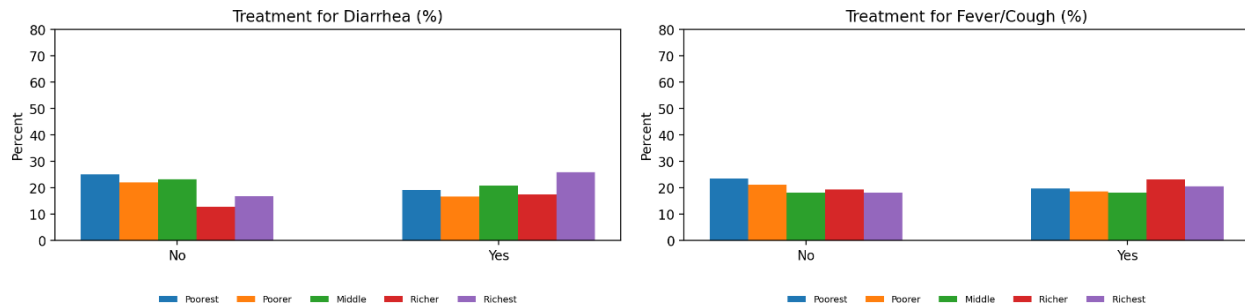


Figure 1-The figure has two side-by-side bar charts showing the wealth distribution (%) of children who did not receive treatment (“No”) versus did receive treatment (“Yes”) for diarrhea (left) and fever/cough (right). Overall, the “Yes” group shows a relatively.

Table 2: Multivariable logistic – on the association of predictor and outcome variables

Predictor variables	Adjusted Odds Ratio-AOR (95% CI)	
	Treatment for Fever/Cough (AOR [95% CI])	Treatment for Diarrhea (AOR [95% CI])
Child’s age in months		
0-4	1.51 (1.08–2.11)*	0.33 (0.03–3.31)
5-9	2.25 (1.62–3.11)***	3.00 (0.26–34.58)
10–14	2.21 (1.59–3.07)***	1.74 (0.18–16.42)
15–19	1.72 (1.24–2.39)**	0.98 (0.10–9.40)
20–24	1.89 (1.36–2.62)***	2.00 (0.19–20.67)
25–29	1.57 (1.13–2.18)**	1.24 (0.12–12.95)
30–34	1.45 (1.03–2.05)*	0.95 (0.09–10.50)
35-39	1.43 (1.03–2.00)*	0.95 (0.09–10.50)
40–44	1.58 (1.10–2.27)*	0.36 (0.03–4.01)
45–49	1.23 (0.88–1.73)	1.80 (0.13–24.16)

50–54	1.30 (0.92–1.83)	3.00 (0.16–57.37)
55–59	1	1
Mother's education		
No education (ref)	1	1
Primary	0.940 [0.652–1.353]	0.965 [0.390–2.390]
Secondary	1.037 [0.717–1.499]	1.579 [0.632–3.942]
Higher	1.088 [0.705–1.678]	2.086 [0.678–6.419]
Mother's occupation		
No formal occupation (ref)	1	1
Professionals	1.000 [0.549–1.820]	0.994 [0.241–4.103]
Agriculture	0.864 [0.711–1.049]*	0.987 [0.527–1.850]
Others	1.031 [0.818–1.298]	0.968 [0.510–1.836]
Place of residence		
Rural (ref)	1	1
Urban	0.999 [0.818–1.220]	1.357 [0.766–2.405]
Wealth index		
Poorest (ref)	1	1
Poorer	0.886 [0.661–1.189]	0.733 [0.359–1.498]
Middle	0.876 [0.638–1.205]	1.002 [0.468–2.142]
Richer	0.995 [0.719–1.376]	0.974 [0.391–2.425]
Richest	1.139 [0.811–1.600]	1.390 [0.434–4.446]
Access to electronic media		
No access (ref)	1	1

Access	1.089 [0.877–1.353]	0.912 [0.484–1.721]
Number of children in the household		
1–2	1.190 [0.809–1.750]	2.390 [0.630–9.068]
3–5	1.263 [0.834–1.913]	2.904 [0.760–11.105]
6 or above (ref)	1	1
Household size		
1–4	0.973 [0.750–1.262]	0.578 [0.203–1.642]
5–6	0.849 [0.664–1.086]	0.669 [0.264–1.694]
Above 6 (ref)	1	1
Father’s highest education		
No education (ref)	1	1
Primary	1.168 [0.883–1.546]	1.662 [0.675–4.093]
Secondary	1.409 [1.040–1.909]**	3.274 [1.216–8.816]**
Higher	1.322 [0.959–1.822]*	2.263 [0.732–6.995]

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$

4.2 Discussion

Background characteristics prevalence of treated use by characteristics (Table 1)

In children with the illness that occurred within the two weeks before the survey, the levels of treatment acceptance varied according to the type of illness (fever/cough vs. diarrhea). In your sample, 31.9% children with fever/cough received medical care (1,205 treated of 3,778 symptomatic children) and 46.8% of children with diarrhea received medical care (193 treated of 412 symptomatic children). Overall, this trend is yet to be completely utilized with the use of medically trained care as far as common childhood illnesses are concerned, which aligns with the issue of low treatment utilization in the base paper.

Fever/ cough (bivariate patterns): There was a significant change in treatment use based on several characteristics. The age gradient was apparent with treatment maximum among younger age

groups and descending as the children became older. There were also differences in treatment by child sex (male child was characterized with a higher percentage of treatment compared to females), the age of mother, occupation of the mother, the number of children in a household, wealth index, division, birth order, household size and distance to a health facility (as viewed by a mother).

Bivariate patterns (diarrhea): Contrarily, there were more background factors with strong differences in the bivariate. But division was statistically significant and this indicates that even before the introduction of an adjustment level, geographic variation in uptake of diarrhea treatment was apparent.

Multivariable logistic regression findings (Table 2)

The adjusted models (AOR with 95% CI) indicate that determinants were considerably more evident in fever/ cough than in diarrhea-- very comparable to the trend highlighted in the base paper (more significant predictors in fever/ cough; less accurate predictions in diarrhea).

Medical treatment determinants of medical treatment in fever/cough:

Child age was the most predictive and reliable after adjustment. Younger children were much more likely to receive treatment compared with their counterparts aged 48–59 months, particularly those aged under 6 months, 6 -8, 9-11, 12-17 and 18-23, 24-35 months (All statistically significant).

In the case of parental factors, education of the father indicated the presence of the impact that higher odds of receiving treatment were exhibited among children whose fathers had secondary education (significant and marginal).

Other predictors like the education of the mother, urban/rural place of residence, wealth index, access to media, household size and number of children in the household were not statistically significant in the adjusted fever/cough model (their confidences covered 1).

Predictors of the medical treatment of diarrhea:

The few factors that made it to conventional significance in the diarrhea model are not many. Others with smaller ages (6-8 and 9-11 months) were marginally significant (10% level), and father secondary education had a significant correlation with increased odds of getting diarrhea treatment. The other predictors (education of mother, occupation of mother, wealth, residence, media access, household structure) proved not to be statistically significant after correction.

Findings

On the whole, my findings demonstrate that the treatment-seeking is not completely related to common childhood illnesses, and determinants of treatment vary in accordance with the diagnosis of fever/cough and diarrhea. This overall message is very similar to the underlying paper: although treatment is available, not every child can receive it, and disparities in treatment exist across demographic and household lines.

Among the important things I learned during this study work is the striking impact of age of children especially in fever/ cough. The probability of treatment of younger children was large in comparison with that of children aged 48-59 months. This tendency is explainable by the fact that the caregivers might see the infants and very young children to be more vulnerable and responsive to their illnesses. Children at an older age are people who can be seen as resilient thus they delay or reduce the use of formal care.

The other similar observation to my regression is the significance of education of the father. The education attained by fathers in secondary education showed significant correlation with increased odds of treatment of cases of fever/cough and diarrhea. This is probably the indication of more awareness of the health risk, higher decision-making level, and the level of navigation in healthcare choices. More educational fathers can also be more in a position to cover costs, understand danger signs and emphasize care on time.

Alternatively, my models also did not reveal strong adjustment independent effects of other variables like wealth, urban or rural residence, and education of mother. This does not imply that the effects, of these factors cannot be relevant; it just implies that they can do so by interacting with each other and through repeated pathways. As an example, the part that can be impacted by wealth in the model is access, which can be partially provided by education or other attributes of the household. Equally, access-related patterns or regional patterns can imply the urban rural disparities. Thus, non-statistical significance is to be taken as smaller independent explanatory power in the existence of other variables- not as evidence of no inequality in the real world.

In the case of diarrhea, the less significant statistical significance of a large number of predictors can also indicate the lack of sufficient sample size and inaccuracy. The large confidence intervals are an indicator of uncertainty and as a result there is possibility of certain real changes but that may not have been pointed out clearly in this data set and specification. Such an explanation also

assists in understanding why the number of predictors that are significant in the diarrhea model were less than in fever/cough.

Overall, my results can be reflected by the same general implication highlighted in the base paper: the effectiveness of child health treatment coverage should be enhanced by considering the caring behavior, awareness, and household-level decision-making, with special consideration on the groups characterized by low treatment. The influence of age of children and the education of their fathers in my findings is strong, which has indicated that the interventions based on childhood awareness, early care-seeking, and decision support at the household level could be useful in enhancing children access to timely treatment of childhood diseases.

Some reasons for insignificance in Table 2:

Since the multivariate analysis corrected several factors, some predictors that were significant in the results of the bivariate analysis, had no statistical significance due to the adjustment that eliminated the predicting influences of confounding. That is to say, factors that are wealth status, parental education, geographic region, and place of residence are usually correlated with each other, and therefore when a combination of these factors is simultaneously integrated in the model, the independent effect of any single factor can be reduced. The other reason is a small statistical power especially in the diarrhea analysis as there were less children who were symptomatic of diarrhea relative to the number of children with fever/cough. The reduction in the size of the sample will result in increased confidence intervals and a smaller possibility of statistically significant associations being detected in the presence of real effects. Moreover, a lot of explanatory variables were further sub-divided into several categories (e.g. education levels, wealth quintiles, age groups of children), further narrowing the number of observations in each category and throwing uncertainty in estimating them, particularly, in the diarrhea model. Lastly, the adjusted odds ratios of certain predictors were under one meaning that there was insignificant effects of the independent variables even after factoring in the other factors, which means that the independent effects were not statistically significant and thus not significant in comparison to the null hypothesis of absence of the independent effects.

5. Policy Implication

The ensuement of uptake of fever and cough treatment should be a priority area of coverage due to the fact that these inequalities are greatest when it comes to these conditions. Expansion of same-day triage and IMCI/IMNCI fast-track services at community clinics and primary healthcare sites and the compulsory use of community health workers (CHWs) to actively follow an under-five year old with cough and fever cases and actively refer to children with signs of danger can be considered additional solutions to fever and cough care-seeking. Meanwhile, the drop-out in treatment of older under-five children (36-59 months) should be specifically targeted with correcting under-response of caretakers using age-specific counseling messages stressing that older under-five children also require trained medical care. This may be supplemented by integrating such counseling into CHW household visits and facility encounters, and adding age prompts into service registers, and clinical checklists to make sure that children aged 36-59 months are not deprioritized as they receive care. There is also a need to address gender inequalities; hence, gender-equitable care-seeking is to be reinforced by systematically tracking the uptake of fevers and cough treatment among child sex at both facility and upazila levels, discussing disparities during usual health-system gatherings, and interceding household counseling interventions which clearly invalidate preferential treatment and favor both girls and boys to seek care. Also, as the paternal education has become a consistent factor in terms of the treatment use, direct engagement of the father as an important decision-maker to the treatment more options must be introduced via workplace, community, and mobile-based messages, and institutional change requires the introduction of father-inclusion counseling at the points of registration and discharge in order to visit the children with illnesses.

Geographic inequalities need national specific programming instead of homogenous national programming. Watchlists at divisions and upazila level can be created to reveal the localities with low coverage with treatment and then additional outreach staff deployed, supervisory effort increased, and demand-generation money focused on the lowest performing regions found in the research. The distance, travel and time cost barriers to structural access should also be considered by offering the transportation support systems which include vouchers or reimbursements on the visits to sick children in hard to reach area, extending the availability of the last-mile service with the help of the satellite clinics or outreach clinic days and decreasing the waiting time with the help of the better triage system and separation of the queue to visit the acute cases of the under-

five cases. The importance of financial protection mechanisms at point of care should also be emphasized to reduce over-reliance on the unqualified providers; through the successful provision of continuous availability of childhood illness commodities, such as protocol based antibiotics, antipyretics and basic diagnostics where applicable as well as by implementing policies of the free-waiver or low-cost access to acute under-five illnesses and tracking the effect of equity (through stock-outs). Treatment coverage of diarrhea can be considered more favorable, but it is important to sustain improvement through continuing the first-line treatment messages and case management using CHWs and health facilities in addition to increasing the intensity of outreach and case follow-up in divisions where diarrhea treatment coverage is showing lower. Lastly, accountability measures are to be enhanced by consistent search of the presence of fever/cough and diarrhea treatment usage among symptomatic under-five children by divides by child age group, sex, division, residence and feasible proxies of paternal education. Other performance indicators must be CHW referrals completion rates, occurrence of stock-outs of important commodities and median time that sick under-five children take to receive qualified care to help assure that program implementation is consistent with the observed determinants of healthcare utilization.

6. Conclusions

This paper indicates that the use of medical treatment related to the prevalent child diseases among under-five children in Bangladesh is still unequal. Patterns of fever/cough treatment were diffused most notably according to socioeconomic and demographic factors, including household wealth, administrative division, the age of children, child sex, and level of education of their fathers, and distance-related constraints of access also made a contribution. In the case of diarrhea the adjusted outcome was less accurate, probably because of the low number of cases, although geographic difference and parental educational trends indicate the possibility of inequalities.

The same findings suggest that disadvantaged and underserved populations should be prioritized during the attempts to enhance the right treatment of childhood illnesses. The actions of policies and programs may center on:

The higher access and service provision in divisions with lower utilization,

Cutting down structural barriers to accessing care (such as distance-related restrictions), and

Will strengthen awareness and care-seeking behavior by means of selective communication especially towards poorer households and those with lower parental education.

Enhancing fair access to medical care about childhood fever/cough and diarrhea can help in the reduction of preventable morbidity and further improvement of child health outcome in Bangladesh.

Declarations

Abbreviations

AOR: Adjusted Odds Ratio; BDHS: Bangladesh Demographic and Health Survey; BMRC: Bangladesh Medical Research Council; CHW: Community Health Worker; CI: Confidence Interval; DHS: Demographic and Health Surveys; IMCI: Integrated Management of Childhood Illnesses; IMNCI: Integrated Management of Neonatal and Childhood Illnesses; OR: Odds Ratio; SES: Socioeconomic Status; U5: Under-five.

Ethics approval and consent to participate

This study involves the secondary analysis of publicly available national data from the Bangladesh Demographic and Health Survey (BDHS). The survey protocol was approved by the Institutional Review Board of ICF International and the Bangladesh Medical Research Council (BMRC). Informed consent was obtained from all participants (or their parents/guardians in the case of minors) prior to interview administration. No primary human or animal data collection was directly conducted by the authors.

Consent for publication

Not applicable.

Availability of data and materials

The datasets analyzed during the current study are available in the DHS Program repository upon registration and official permission from <https://dhsprogram.com>.

Competing Interests

The authors declare that they have no competing interests.

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Authors' contributions

P.D., M.K.H.M., and M.N.H.R. contributed equally to the overall study design and manuscript preparation. Specifically, P.D. contributed to the conceptualization and data curation; M.K.H.M. contributed to the

literature review and discussion; and M.N.H.R. performed the statistical analysis and methodology. All authors critically reviewed and approved the final manuscript.

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