Is There Any Association Between Undesired Children and Health Status of Under-five Children? Analysis of Nationally Representative Sample From Bangladesh

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Abstract

Introduction: Child health, especially childhood mortality, is one of the critical indicators of human development. No child mortality is desirable, but it is still high in Bangladesh. We aimed to assess the effect of the child's desired status of mothers on childhood morbidity and mortality of Bangladesh.

Data and Method: We used the data from nationally representative cross-sectional *Bangladesh Demographic and Health Survey (BDHS) 2014* and restricted the analyses to children born in the past five years preceding the survey. We estimated the undesired status (excess in boy, girl, both, and parity) by subtracting an ideal number of children from the total live birth. We measured childhood mortality (neonatal, infant, and under-five mortality), morbidity (fever, diarrhea, cough, and ARI), and nutritional problems (stunting, wasting, and underweight). Finally, we utilized the chi-square test and multilevel logistic regression analyses.

Findings: The prevalence of undesired children was 20.7%, 23.2%, 4.9%, and 30.3% for boys, girls, both boys and girls, and parity, respectively. Age, education, residence, division, and household wealth index were significantly associated with undesired children. The prevalence of under-five mortality was 3.1% among desired children, almost double (5.9%) among undesired children. The likelihood of under-five mortality was 85% (AOR) to 97% (COR) higher among undesired children than the desired one. Childhood malnutrition (stunting and underweight except wasting) was also higher and significantly associated with undesired children. We also found 17% (AOR: 0.83; 95% CI: 0.72, 0.96) lower postnatal checkup for undesired children. Despite lower under-five mortality among higher socioeconomic status, the relative contribution of undesired children to under-fiver mortality was larger.

Conclusion: The share of childhood mortality and malnutrition was higher among undesired children. Every child should be wanted, and no unwanted pregnancies are desirable; thereby, the government should reemphasize the proper use of family planning methods to reduce child mortality and malnutrition.

Introduction

Since the last decade, Bangladesh has become a promising country with more than 6% growth in gross domestic products [1]. Along with Sub-Saharan African and South Asian countries, unwanted fertility is one of the highest in Bangladesh [2]. The total fertility rate in Bangladesh is 2.3, but the wanted fertility rate is only 1.6. Unwanted childbearing has been associated with increasing poor child health; thus, reducing unwanted childbearing has been regarded as an essential factor for improving child health and survival [3, 4]. Substantial progress has been observed in child and infant survival around the world [5–7]. In 1990, 1 in every 11 children died before reaching their fifth birthday, which has declined to 1 in every 26 children in 2018. Despite this substantial progress, around 15,000 children died every day before reaching their fifth birthday [8]. More than half of the deaths occur from preventable causes, and 90% of all deaths took place in developing countries, including Bangladesh [6, 8]. Malnourished children have a higher risk

of death from common childhood illnesses such as pneumonia (acute respiratory infectious), diarrhea, and malaria. Overall, nutrition-related factors (stunting, wasting, underweight) are responsible for almost 45% of deaths of under-five children [8]. However, childhood mortality and morbidity, including malnourishment, might substantially be higher among undesired children.

Moreover, the United Nations recognizes the must need to end preventable infant and child deaths between 2016 and 2030 [9], and the 3rd goal of Sustainable Development Goals (SDGs) focuses on ensuring healthy lives and promoting wellbeing [10]. As of SDGs, all countries should reduce neonatal mortality and under-five mortality to 12 or fewer and 25 or fewer per 1000 live births within 2030, respectively [6, 7, 10]. The under-five mortality rate of 118 countries had already been below the SDG target. Still, for the remaining countries which are mostly from Sub-Saharan Africa and Central and Southern Asia, progress and promises will need to be accelerated for achieving the target [6, 8]. Therefore, reducing unwanted pregnancy and childbearing will help in reaching the goal.

Bangladesh, the most densely populated country in South Asia, has one of the highest under-five mortality [2, 6]. In many developing countries, including Bangladesh, the leading causes of child mortality are pneumonia, diarrhea, birth complications, malnutrition, malaria, and neonatal sepsis [6, 7, 11, 12]. Moreover, more than half of the diseases are treatable through simple and affordable interventions [8]. However, the health situation for unwanted children is even worse. If a woman delivers more than she desires, then the children (either gender) may face a lack of proper caring, and the reluctance towards unwanted children may start from pregnancy. Shaka et al. (2020) showed that children from unintended pregnancies were three times more likely to be stunted in Ethiopia. The share of childhood mortality from unintended pregnancies were also larger in sub-Saharan Africa [3].

However, a good number of studies have been conducted to find out the determinants and differentials of child mortality, morbidity, and nutritional status of children aged under-five in developed and developing countries [13–29]. Most of the studies identified mother's age, the sex of children, birth order, household size, wealth status, education of parents, nutritional status of mothers, maternal care utilization, region, religion, residence as significant predictors of child health. However, few studies were on the relationship between undesired children and child health in developing countries, especially in the context of Bangladesh [3, 4, 30]. Every child is wanted, [31], and wanted fertility will reduce child mortality and stabilize population growth. Moreover, women with unintended pregnancies were at higher risk of developing morbidity, including high blood pressure and anemia during pregnancy [32]. As a result, higher child and maternal mortality may occur. For instance, care-seeking behavior for mobility might be different for undesired children.

Bangladesh is one of the countries which has the highest child marriage rate [2]. Early childbearing, due to child marriage, contributes to having a higher number of unwanted children [33], which may increase the likelihood of poor maternal and child health outcomes [32]. The country also needs to achieve the third SDG of the ambitious child survival goal by 2030, which will be very challenging with a vast number of undesired children. Thus, we first aimed to measure the prevalence of undesired children and their

differentials. Then, we assessed the effect of undesired children on under-five child survival (neonatal, infant, and child mortality), morbidity and its treatment (acute respiratory infection, fever, diarrhea), postnatal care, and nutritional status (stunting, wasting, underweight, and overweight) by adjusting key socioeconomic covariates.

Methodology

Source of Data and Inclusion Criteria

We utilized the data from the latest *Bangladesh Demographic and Health Survey (BDHS), 2014* [2]. The 2014 BDHS is the seventh of its type undertaken in Bangladesh as a part of an international program of measures DHS which follows two-stage stratified sampling with a response rate of 97.9%. The sample for the BDHS 2014 is nationally representative, and detailed methodology will be found in the methodology section of the final report [2]. The 2014 BDHS collected information of 17863 ever-married women, and all ever-married women were asked to provide detailed information about their desire and actual births in the past five years preceding the survey. We excluded the women who desired more than nine children (88 of 8092), as higher than 9 children is equivalent to natural fertility, and the number of children ‘up to god’. After the restriction, there were 7994 live-births five years preceding the survey (Table 1). For the validation of the measures of undesired children, we also used whether last child was wanted or not (n = 5658).

Table 1
Sample size of the study (weighted)

Outcome variables	Sample size	Outcome variables	Sample size
Childhood Malnutrition		**Childhood Morbidity**	
Stunting	7220	Fever	7662
Wasting	7220	Diarrhea	7662
Underweight	7220	Cough	7662
Size of birth	4806	Short and/or rapid breath	7662
Childhood Mortality		Acute respiratory infectious	7662
Perinatal	8171	**Treatment for Childhood Morbidity**	
Early neonatal	7994	Postnatal checkup of baby within 2 months	4589
Late neonatal	7994	Treatment for diarrhea	439
Post neonatal	7994	Treatment for fever/cough	3262
Infant	7994	Vitamin A in last six months	7662
Child	7994		
Under-five	7994		

Outcome variables

Outcome variables of this study were childhood mortality (including early neonatal, late neonatal, post-neonatal, infant, child, and under-five mortality), morbidity (including fever, diarrhea, cough, short and/or rapid breath, and ARI), treatments for common morbidities (fever and diarrhea), receiving PNC within two months after the birth, and malnutrition (including undernutrition and over-nutrition).

Childhood mortality was defined based on the timing of mortality in the last five years preceding the survey [34]. Stillbirths (SB) are the pregnancies that lasted seven or more months in the womb and terminated in fetal death. Early neonatal mortality rate (ENMR) is the percentage of children who died at age 0–6 days after birth. Perinatal mortality is the sum of SB and ENMR. Neonatal mortality rate (NMR) is the percentage of death of children aged 0 to 28 days, while the post-neonatal mortality rate (PNMR) is the death of children aged between 29 and 364 days. NMR and PNMR together measure infant mortality rate (IMR). The under-five mortality rate (U5MR) is the death of children before reaching five years old.

All the morbidity information was collected having a presence of disease (yes/no) at any time in the last two weeks preceding the survey. We measured the fever as the percentage of children under age five with the fever at any time within the previous two weeks preceding the survey. Cough and short and/or rapid breathing also measured with the same procedures as fever. The acute respiratory infection (ARI) was calculated as the percentage of children under age five with the symptoms of chest-related short or rapid

breathing and/or difficult breathing [34]. Along with the most common morbidities, we also considered the baby's postnatal checkup within two months, treatment for diarrhea, and treatment for fever/cough.

DHS measures nutritional status based on both mother's estimate and anthropometric measurement. The child's size at the time of birth was measured according to the mother's estimate. Using anthropometric measurement, we estimated stunting (height-for-age), wasting (weight for height), underweight (weight for age), and overweight based on the WHO Child Growth Standards (-2 or -3 SD below the mean for undernutrition and above + 2 SD for overnutrition) [34, 35].

Predictor

In this study, we aimed to measure undesired children with socioeconomic differentials. Undesired children might directly be associated with parity, mother's age, education, and income, and we strived to consider it during measurement. For instance, the key predictor of this study was the 'desired status of children' categorized as excess in children (including excess in boy, excess in girl, excess in both, and excess in parity) and no-excess in children. In DHS, women aged 15–49 were asked about the ideal number of children including gender composition, whether they would like to have boys (number of boys), girls (number of girls) or either boys or girls (number of either gender) [2, 34]. We measured four types of undesired children, (a) being excess in boy child, (b) being excess in the girl child, (c) being excess in both boys and girls (dual excess), and (d) being excess in parity (excess in the total number of children). We measured undesired children using the conventional approach as found in existing literature [3, 36–39]. The ideal number of children is the combination of a number of a boy, girl, and either gender (mother might prefer either gender of child), while the total number of live births is the combination of boy and girl child. If the total number of children exceeds the preferred number, then it would be excess in parity. If the number of boys exceeds the number of ideal boys plus the number of either sex, it would be excess in the boy. A similar approach would be for excess in girls. Finally, if it exceeds both the number of boys and girls, it would be dual excess. However, to validate the measures of undesired children, we also utilized the built-in BDHS variable "whether wanted last pregnancy" coded as "wanted then," "wanted later," and "wanted no more" (findings are given in supplementary materials) which suffers more from rationalization (as the unwanted child may be wanted after birth).

Other Covariates

We selected other covariates based on the existing literature [13, 14, 22, 23, 40] and demographics, socioeconomic, spatial, and programmatic factors affecting the health status of children. Demographic and health factors, including the current age of mother, age of child/ year of birth, parity/ birth order, and sex of the child, were also considered. We categorized the current age of women and age of motherhood into < 20, 20–34, and 35–49 years which was also used in other studies [13, 14, 40].

We included women's and husbands' education (categorized as no education, primary, secondary, and higher), wealth index, employment status, women empowerment, and religion as socioeconomic factors. The wealth index, which is used to assess the socioeconomic status of the household, was constructed from data of household possessions using the principal component analysis and divided into three

groups (poor, middle, and rich) based on overall asset ownership. We measured women empowerment using three information: the person who usually decides on the respondent's health care, the person who usually determines on large household purchases, and the person who usually decides on visits to family or relatives. The Cronbach's alpha value was 0.81, suggesting very good internal consistency. We categorized empowerment as high if the decision was made by the respondent alone, moderate empowerment if the decision was made jointly with the husband or others, and low empowerment if husbands or others made the decision. Religion was categorized as Muslim and non-Muslim (Hindu, Buddhist, or Christian) due to most Muslims in Bangladesh.

Administrative division (8 division Barisal, Chattogram, Dhaka, Khulna, Rajshahi, Rangpur, and Sylhet) and place of residence (whether residing in the urban or rural area) are two major spatial factors we included in the study. Moreover, we had antenatal care (ANC), postnatal checkup (PNC) (also used a dependent variable for baby), visits by family planning (FP) workers, and access to any media (TV, Radio, Newspaper or Magazines) for FP information as programmatic factors affecting child health in Bangladesh. We categorized ANC and PNC as yes, no, and unknown, which was also used by another researcher [14] as DHS collects the information for last birth.

Statistical Analysis

We performed both bivariate and multiple variables analyses. For bivariate analysis, we used the chi-square test and simple multilevel logistic regression analysis for adjusting cluster variance. Based on the significance of the simple logistic regression (probability value of ≤ 0.05), we used multilevel multiple logistic regression analyses to identify the effect of undesired children on childhood morbidity and mortality in Bangladesh. The eeducational attainment of the husband, the wealth index, visits by FP workers, ANC, and PNC were excluded from the multiple analyses due to multicollinearity. Finally, we entered all significant variables and utilized the manual stepwise conditional elimination process for best fitting the regression models. The probability value (p-value) of the chi-square test and logistic regression analyses were provided. The crude odds ratio (COR) and the adjusted odds ratio (AOR) with 95% confidence interval (CI) of logistic regression analyses were produced.

Findings

Undesired Children in Bangladesh

Figure 1 presents the percentage of living children by distance to the desired number of children. The plot showed that about 35% of women had a lower distance to ideal family size, while about 30% had a higher distance. The rest of the women had equal distance (zero distance) to ideal family size. Lower distance and equal distance expressed the desired number of children, while the higher distance showed the undesired number of children.

The overall undesired children (excess from ideal number) were 21%, 23%, 5%, and 30% for boys, girls, both boys and girls, and parity, respectively (Fig. 2). The excess in parity was the highest observed among

single parity women, followed by parity two. The highest excess in boys, girls, and both were seen among the four parity women, respectively.

Table 2 provides the undesired children by selected background characteristics of the study population. Most of the socioeconomic characteristics were significantly associated with undesired children. The prevalence of undesired children was the highest among adult mothers (aged 35–49 years). The excess of boys, girls, both, and parity were 51.5%, 52%, 27.4%, and 76.15 among the mothers aged 35–49. The women from urban areas, as well as from the Sylhet region, had a higher prevalence of undesired children. The rate of undesired children was higher among Muslim women. It was quite exciting but plausible that non-educated and poor women had a higher rate of undesired children. Working women had higher undesired children than non-working, but women having access to any media had the lower one.

Table 2
Percentage of undesired children by selected socioeconomic characteristics

Background characteristics	Excess of boy	Excess of girl	Dual excess	Excess of parity	Number
Age of motherhood	***	***	***	***	
11–19	25.2	28.3	5.6	38.7	1178
20–34	5.8	7.0	0.1	4.1	2724
35–49	51.5	52.0	27.4	76.1	2223
Place of residence	***	***	***	***	
Urban	17.5	18.4	2.7	25.3	2034
Rural	21.8	24.8	5.6	32.1	5962
Division (Region)	***	***	***	***	
Barisal	22.5	23.0	5.3	30.4	457
Chattogram	20.7	23.8	5.0	28.9	1715
Dhaka	21.8	22.7	5.5	30.9	2801
Khulna	13.5	19.2	1.3	24.1	609
Rajshahi	19.5	23.0	2.8	29.8	821
Rangpur	17.4	20.6	3.9	27.7	792
Sylhet	25.7	29.3	8.5	39.3	802
Religion	***	*	***	***	
Muslim	21.1	23.5	5.2	31.0	7311
Other	16.4	19.6	2.1	23.5	685
Household wealth quintile	***	***	***	***	
Poor	24.5	28.4	7.4	37.5	3338
Middle	19.8	21.1	3.6	27.1	3131
Rich	14.4	16.0	2.2	21.2	1527
Educational level of women	***	***	***	***	

*** and * denotes < 0.001 and < 0.05 level of significance of chi-square

Background characteristics	Excess of boy	Excess of girl	Dual excess	Excess of parity	Number
No education	37.4	38.6	14.2	56.8	1288
Primary	22.4	28.0	5.3	35.3	2239
Secondary	16.2	17.8	2.4	22.1	3721
Higher	9.8	9.0	0.3	11.2	747
Husband's education level	***	***	***	***	
No education	29.3	35.0	10.1	45.1	2062
Primary	21.3	23.5	4.7	32.1	2412
Secondary	16.2	18.0	2.3	22.0	2434
Higher	13.5	11.8	1.1	17.1	1087
Access to any media for FP	***	***	***	***	
No	21.7	24.5	5.4	32.1	6439
Yes	16.8	17.7	2.8	23.0	1558
Working status of women	***	***	***	***	
No	19.8	21.3	4.1	28.3	5886
Yes	23.4	28.6	7.1	36.0	2108
Total	**20.7**	**23.2**	**4.9**	**30.3**	**7994**

*** and * denotes < 0.001 and < 0.05 level of significance of chi-square

Childhood Mortality, Morbidity, and Nutritional Problem by Undesired Status

Childhood Mortality

Table 3 presents the childhood mortality rate by the desired status of children in Bangladesh. The prevalence of early neonatal mortality was 2.3%, with 1.8% among desired parity and 3.3% among excess in undesired parity. The perinatal mortality rate was 3.9%, with a variation of 3.8% among desired children and 4.3% among undesired children. However, neonatal mortality was 4% among excess in undesired boys but only 2.3% among desired boys. Between excess and non-excess in girls, the prevalence of post-neonatal mortality was 2.2% and 0.8%, respectively. Moreover, the prevalence of under-five mortality was 3.1% among desired children, almost double (5.9%) among undesired children.

Childhood Nutritional Problem

More than 36.0% of children under age five were stunted, 14.8% were wasted, and 32.8% were underweight (Table 3). The prevalence of severely stunting, wasting, and underweight was 11.6%, 3.2%, and 7.8%, respectively. Similarly, the prevalence of small and large size children, based on mother's estimate after birth, was 20% and 12.6%, respectively. The prevalence of stunting and underweight was higher among undesired children. On the other hand, the prevalence of overweight was higher among the desired children.

Childhood Morbidity

We found that 5.5% and 35.2% of children had experienced diarrhea and fever in the last two weeks preceding the survey, respectively (Table 3). About 31% and 14% of children had a cough and short or rapid breath, respectively. The prevalence of symptoms of acute respiratory infection was 5.1%. Most of the childhood mortality and morbidly was higher among desired children, but ARI was higher among excess in boys.

Table 3
The prevalence of morbidity and mortality among births in past five years by desired status of children in Bangladesh

Childhood Mortality and Morbidity	Excess in Boy		Excess in Girl		Dual Excess		Excess in Parity		Total
	No	Yes	No	Yes	No	Yes	No	Yes	
Indicators of Child Mortality									
Early Neonatal Mortality	2.0	3.4	2.2	2.6	2.2	3.3	1.8	3.3	2.3
Perinatal Mortality (ICD 10)	3.8	4.4	3.8	4.4	3.9	4.6	3.8	4.3	3.9
Neonatal Mortality	2.3	4.0	2.5	3.1	2.6	3.6	2.2	3.7	2.7
Post Neonatal Mortality	1.1	1.5	0.8	2.2	1.2	1.5	0.8	2.1	1.2
Infant Mortality	3.4	5.6	3.4	5.3	3.8	5.1	3.0	5.7	3.8
Child Mortality	0.1	0.2	0.1	0.2	0.1	0.3	0.1	0.2	0.2
Under 5 Mortality	3.5	5.7	3.5	5.5	3.9	5.4	3.1	5.9	4.0
Indicators of Child Morbidity: Childhood Nutritional Status									
Severely Stunted	10.7	15.4	10.5	15.3	11.3	18.3	9.7	16.2	11.6
Moderately Stunted	34.9	41.8	34.8	41.5	35.6	50.0	33.9	42.0	36.3
Over-Height for Age	0.8	1.2	1.0	0.5	1.0		0.9	1.0	0.9
Severely Underweight	7.5	8.8	7.0	10.4	7.6	12.2	6.8	10.2	7.8
Moderately Underweight	32.2	35.4	31.4	37.4	32.5	38.7	30.8	37.7	32.8
Overweight for Age	0.4	0.3	0.5	0.1	0.4		0.5	0.2	0.4
Severely Wasted	3.3	2.8	3.3	2.9	3.2	2.3	3.1	3.4	3.2
Moderately Wasted	15.1	13.5	15.0	14.0	14.7	16.5	14.9	14.4	14.8
Overweight for Height	1.6	0.8	1.6	1.0	1.5	0.6	1.6	1.0	1.5
Small or Very Small Child	20.3	17.9	19.6	20.5	19.6	24.9	19.8	19.8	19.8
Large or Very Large Child	12.8	11.4	13.0	11.1	12.6	11.1	12.8	12.1	12.6
Indicators of Child Morbidity: Most Common Disease in Childhood									
Diarrhea in last two weeks	5.4	5.7	5.6	5.2	5.6	4.1	5.7	4.9	5.5
Fever in last two weeks	35.9	32.9	35.2	35.4	35.2	34.8	35.5	34.7	35.2
Had cough in last two weeks	31.1	30.2	31.3	29.6	31.0	27.9	31.2	30.3	30.9
Short, rapid breaths	13.3	14.4	13.8	12.5	13.5	13.0	13.7	13.1	13.5

Childhood Mortality and Morbidity	Excess in Boy		Excess in Girl		Dual Excess		Excess in Parity		Total
	No	Yes	No	Yes	No	Yes	No	Yes	
Acute Respiratory Infection	5.1	5.5	5.5	4.0	5.3	3.1	5.4	4.6	5.1

Postnatal Care, Vaccination and Treatment for Most Common Childhood Morbidities

Figure 3 illustrates postnatal checkups for babies within two months after birth and medical treatment for common illness by the desired status of children in Bangladesh. Sixty-three percent of children received any type of postnatal care within two months after birth, which was lower among undesired children. Besides, there was no significant variation of treatment for fever by the desired status. In the context of vaccination, around 59% received vitamin A within six months preceding the survey, which was slightly lower for the undesired girl children. However, the vaccination coverage and undesired children were not statistically significant.

Effect of Undesired Children on Childhood Mortality, Morbidity, and Nutritional Problem

We carried out the generalized estimating equation analysis (logistic regression) to assess the effect of undesired children on childhood mortality, morbidity, and nutritional problems. The results (provided in Table 4) showed a significant association between childhood mortality and undesired children in Bangladesh. The undesired children were associated with an increased likelihood of post-neonatal mortality (AOR 2.71, 95% C.I. 1.78–4.12). The probability of under-five mortality was 85% (adjusted odds ratio) to 97% (crude odds ratio) higher among undesired children than that of the desired children. Moreover, among all kinds of undesired children, the likelihood of childhood mortality was higher.

The association between undesired children and childhood malnutrition also showed that the undesired children were significantly associated with an increased likelihood of stunting and underweight. Adjusted analysis showed that if the children were excess in parity, they were 50% (95% C.I. 1.29 to 1.75) more likely to be stunted. The odds of over-nutrition was higher among desired children but was not statistically significant. We also found no significant association between undesired children and wasting.

Although we noted no significant effect of undesired children on childhood diseases, the postnatal checkup for babies within two months after birth was 17% (AOR 0.82, 95% C.I. 0.72 to 0.96) lower among children who was excess in parity.

Table 4
Generalized estimation of morbidity and mortality among births in past five years by desired status children in Bangladesh

Childhood Mortality and Morbidity	Excess in Boy		Excess in Girl		Excess in Parity	
	COR (95% C.I.)	AOR (95% C.I.) [a]	COR (95% C.I.)	AOR (95% C.I.)[a]	COR (95% C.I.)	AOR (95% C.I.)[a]
Mortality						
Early Neonatal Mortality	1.79 (1.30, 2.46)**	1.73 (1.25, 2.40)**	1.22 (0.88, 1.71)		1.79 (1.33, 2.41)**	1.68 (1.24, 2.28)**
Neonatal Mortality	1.77 (1.32, 2.38)**	1.68 (1.25, 2.28)**	1.23 (0.91, 1.68)		1.67 (1.28, 2.21)**	1.54 (1.16, 2.04)**
Post Neonatal Mortality	1.44 (0.91, 2.28)*	1.43 (0.89, 2.29)*	2.62 (1.73, 3.95)**	2.43 (1.60, 3.69)**	2.72 (1.81, 4.10)**	2.71 (1.78, 4.12)**
Infant Mortality	1.68 (1.31, 2.16)**	1.62 (1.25, 2.01)**	1.60 (1.25, 2.05)**	1.48 (1.15, 1.90)**	1.97 (1.57, 2.48)**	1.85 (1.46, 2.34)**
Child Mortality	1.67 (1.31, 2.14)**	1.62 (1.26, 2.08)**	1.60 (1.26, 2.04)**	1.48 (1.16, 1.89)**	1.97 (1.58, 2.47)**	1.85 (1.47, 2.33)**
Under 5 Mortality	1.79 (1.30, 2.46)**	1.73 (1.25, 2.40)**	1.22 (0.88, 1.71)		1.79 (1.33, 2.41)**	1.68 (1.24, 2.28)**
Nutrition [b]						
Severely Stunted	1.52 (1.29, 1.80)**	1.28 (1.08, 1.51)**	1.53 (1.30, 1.80)**	1.32 (1.12, 1.56)**	1.80 (1.52, 2.10)**	1.50 (1.29, 1.75)**
Moderately Stunted	1.34 (1.19, 1.51)**	1.14 (1.01, 1.29)*	1.33 (1.19, 1.49)**	1.15 (1.02, 1.29)*	1.41 (1.27, 1.56)**	1.18 (1.06, 1.32)**
Over-Height for Age	1.43 (0.83, 2.48)		0.51 (0.25, 1.04)*	0.57 (0.28, 1.17)	1.10 (0.65, 1.86)	

Note: ** and ** denotes ≤ 0.05 and ≤ 0.01 level of significance; COR and AOR denote crude odds ratio and adjusted odds ratio, respectively. C.I. means confidence interval. a: Adjusted analyses (or AOR) controlled for parity, age of mother, place of residence, division, religion, respondent's education, access to any media for FP, working status of women, and women empowerment. b: childhood diseases were also controlled for childhood malnutrition. c: childhood malnutrition were also controlled for childhood diseases.*

Childhood Mortality and Morbidity	Excess in Boy		Excess in Girl		Excess in Parity	
	COR (95% C.I.)	AOR (95% C.I.) [a]	COR (95% C.I.)	AOR (95% C.I.)[a]	COR (95% C.I.)	AOR (95% C.I.)[a]
Severely Underweight	1.18 (0.96, 1.45)		1.54 (1.28, 1.86)**	1.33 (1.10, 1.62)**	1.57 (1.31, 1.87)**	1.29 (1.07, 1.55)**
Moderately Underweight	1.16 (1.03, 1.31)*	0.99 (0.87, 1.12)	1.31 (1.16, 1.47)**	1.13 (1.01, 1.28)*	1.36 (1.23, 1.52)**	1.15 (1.03, 1.29)*
Overweight for Age	0.75 (0.28, 2.01)		0.13 (0.02, 0.86)*	0.18 (0.03, 1.21)	0.39 (0.13, 1.09)	
Severely Wasted	0.86 (0.61, 1.22)		0.86 (0.62, 1.20)		1.13 (0.86, 1.51)	
Moderately Wasted	0.88 (0.75, 1.04)		0.93 (0.79, 1.08)		0.96 (0.83, 1.11)	
Overweight for Height	0.49 (0.25, 0.87)*	0.53 (0.29, 1.01)*	0.58 (0.34, 1.00)*	0.67 (0.39, 1.16)	0.63 (0.39, 1.01)*	0.74 (0.45, 1.19)
Morbidity[c] and treatment						
Diarrhea in last two week	0.49 (0.23, 0.98)*	0.40 (0.20, 0.83)*	1.86 (1.16, 2.99)**	1.59 (0.98, 2.57)*	1.37 (0.86, 2.19)	
Fever in last two weeks	0.88 (0.78, 0.99)*	0.86 (0.76, 0.96)**	1.01 (0.91, 1.13)		0.96 (0.87, 1.06)	
Cough in last two week	0.96 (0.85, 1.08)		0.93 (0.82, 1.03)		0.96 (0.87, 1.06)	
Short, rapid breath	1.10 (0.94, 1.28)		0.89 (0.77, 1.04)		0.95 (0.83, 1.10)	

Note: ** and ** denotes ≤ 0.05 and ≤ 0.01 level of significance; COR and AOR denote crude odds ratio and adjusted odds ratio, respectively. C.I. means confidence interval. a: Adjusted analyses (or AOR) controlled for parity, age of mother, place of residence, division, religion, respondent's education, access to any media for FP, working status of women, and women empowerment. b: childhood diseases were also controlled for childhood malnutrition. c: childhood malnutrition were also controlled for childhood diseases.*

Childhood Mortality and Morbidity	Excess in Boy		Excess in Girl		Excess in Parity	
	COR (95% C.I.)	AOR (95% C.I.) [a]	COR (95% C.I.)	AOR (95% C.I.)[a]	COR (95% C.I.)	AOR (95% C.I.)[a]
Acute Respiratory Infection	1.09 (0.85, 1.38)		0.72 (0.56, 0.93)*	0.69 (0.52, 0.87)**	0.85 (0.68, 1.06)	
Postnatal checkup of baby within 2 months	0.80 (0.69, 0.93)**	0.93 (0.80, 1.09)	0.83 (0.72, 0.97)*	0.94 (0.80, 1.10)	0.72 (0.63, 0.82)**	0.83 (0.72, 0.96)**
Treatment for diarrhea	0.68 (0.41, 1.11)		0.82 (0.51, 1.33)		1.16 (0.75, 1.79)	
Treatment for fever/cough	0.80 (0.67, 0.97)*	0.90 (0.74, 1.09)	0.86 (0.73, 1.03)		0.86 (0.74, 1.01)	

Note: ** and ** denotes ≤ 0.05 and ≤ 0.01 level of significance; COR and AOR denote crude odds ratio and adjusted odds ratio, respectively. C.I. means confidence interval. a: Adjusted analyses (or AOR) controlled for parity, age of mother, place of residence, division, religion, respondent's education, access to any media for FP, working status of women, and women empowerment. b: childhood diseases were also controlled for childhood malnutrition. c: childhood malnutrition were also controlled for childhood diseases.*

Childhood morbidity, mortality, and malnutrition varies with the socioeconomic status of the mother. Figure 4 and Fig. 5 show the percentage of under-five mortality rates attributable to undesired children by educational attainment and household wealth index of the mother. Female education is thought to be a significant determinant of fertility and mortality decline. We observed that the under-five mortality rate was the lowest among the higher educated mother. Nevertheless, irrespective of educational attainment, the relative contribution of undesired children to under-five mortality was larger for boys, girls, and parity; so, did household wealth index.

Discussion

The efforts had been provided, in this study, to assess the effect of undesired children on childhood mortality, morbidity, and nutritional problems in Bangladesh. The findings showed that the overall undesired children were 21%, 23%, 5%, and 30% for boys, girls, both boys and girls, and parity, respectively. Age, education, residence, division, and household wealth index were significantly associated with undesired children. The prevalence of under-five mortality was 3.1% among desired children and was almost double among undesired children. The likelihood of under-five mortality was higher among undesired children. Childhood malnutrition (stunting and underweight except wasting) was also higher and significantly associated with undesired children. We noted no significant effect of undesired children on childhood diseases. But the postnatal checkup for baby within two months after birth was 17% lower among children who were excess in parity.

The findings of this study were both consistent and inconsistent with previous studies [3, 30, 41–44]. There were substantial gender preference (especially son preference) in south Asian and African countries [3, 30, 41, 42, 45, 46]. Previous literature from Bangladesh also showed son preference [47, 48], but we observed 2–3% higher unwanted boys than girls. We found that a child being undesired to the mother was associated with differential mortality that was not by accident or by maternal factors (e.g., age), and it was consistent with recent literature [3, 44, 49]. The probable explanation would be that if a woman delivers more than she desires, then the children (either gender) may face a lack of proper caring. The reluctance towards unwanted children may sometimes start before birth.

Moreover, previous studies showed that higher childhood mortality was associated with lower socioeconomic status [2, 6, 7]. Female education, a major socioeconomic status, is thought to be a significant determinant of fertility and mortality decline. We also found that childhood mortality was higher among lower socioeconomic status. Nevertheless, irrespective of educational attainment, the relative contribution of undesired children to under-five mortality was larger. Similar findings were also observed for the household wealth index. The adjusted model validated the results, similar to existing studies [3, 44].

This current study also showed that unintended pregnancy was significantly associated with low birth weight [32]. The possible reason was that the mother might be reluctant about the proper diet for undesired pregnancy resulting in higher nutritional problems. Unwanted pregnancy may be ended in safe abortion, but abortion is illegal in Bangladesh [13]. As a result, most of the unwanted pregnancies ended in unwanted birth, and unwanted children might suffer from inequitable care.

Undesired children are significantly associated with an increased likelihood of stunting and underweight, similar to existing studies [50, 51]. Shaka et al. (2020) showed that children from unintended pregnancies were three times more likely to be stunted in southern Ethiopia. We also found the prevalence of overweight was higher among the desired children. Similarly, having unwanted or mistimed at conception showed adverse effects on the growth of children (especially stunting) when compared with children reported as wanted [49]. The possible reason might be taking extra care for both the mother and child during pregnancy and after birth. We noted no significant effect of undesired children on childhood diseases but found lower PNC and treatment of fever/cough among undesired children.

Moreover, though vaccination coverage is very high in Bangladesh, the undesired girl had slightly lower coverage. Marston and Cleland (2003) also showed similar findings for vaccination coverage. Unwanted childbearing has always been associated with increasing poor child health; thus, reducing unwanted childbearing has been an essential factor for improving child health and survival [3, 4, 49].

Strengths And Limitations

This study has some compelling strengths since it was the first study to identify the effect of undesired children on childhood mortality and morbidity in Bangladesh. We analyzed the nationally representative

data, which might increase the acceptability and generalization to another setting of similar socioeconomic status. We utilized multilevel logistic regression analyses for adjusting cluster variations. Despite such strengths, the study has some limitations. Existing studies showed some limitations of measuring unwanted children [3, 30, 36, 37, 39, 52–54], which were also applicable for this study. Unwanted pregnancy might become wanted after birth due to the ethical perspective of mothers, which may underestimate by the rate of undesired children [55]. However, we found low undesired children using direct BDHS question than an indirect approach (using desired and live birth). Undesired children might positively be correlated with parity as increasing the number of children increases the rate [3]. We found that among higher parity women, the percentage of undesired children is also higher. The size of the child after birth was mostly self-reported by the mother as only 37% of deliveries were at health facilities [2]. Self-reported data is sometimes vulnerable to recall bias and social desirability bias. Besides, the use of data from a cross-sectional research design was less than ideal for determining causality. How did a mother deal with an unwanted pregnancy and the child would not be found with a quantitative study. Therefore, a qualitative study and prospective cohort study would bring the best results and explore the relation of the behavioral and psychological factors to pregnancy, births, and child rearing.

Conclusion And Implication

This current study stated that the share of childhood mortality and malnutrition was higher among undesired children. Regarding policies to address childhood mortality and malnutrition in Bangladesh, the findings highlight the concepts of the ideal family. Limiting unwanted childbearing may reduce some of the differential mortality of undesired children, and unwanted pregnancy may be overcome with the proper utilization of modern contraception. As a result, it will help achieve the Sustainable Development Goal of reducing infant and under-five mortality. However, undesired children may be given birth due to desire sex composition. To get the desired sex of children, many women may frequently become pregnant and give birth to undesired sons or daughters. Therefore, a strong message should provide against gender preferences. We can also have a slogan that no unwanted pregnancies are desirable. Thereby, the government should reemphasize the family planning program to reduce childhood mortality, morbidity, and malnutrition due to unwanted pregnancies and childbirths.

Abbreviations

ANC
Antenatal Care; AOR:Adjusted Odds Ratio; ARI:Acute Respiratory Infection; BDHS:Bangladesh Demographic and Health Survey; COR:Crude Odds Ratio; ENMR:Early Neonatal Mortality Rate; IMR:Infant Mortality Rate; NMR:Neonatal Mortality Rate; PNMR:Post-Neonatal Mortality Rate; SB:Stillbirths; SDG:Sustainable Development Goals; U5MR:Under-Five Mortality Rate.

Declarations

Ethics Approval and Consent to Participate

The 2014 BDHS was conducted by the National Institute of Population Research and Training (NIPORT) of the Ministry of Health and Family Welfare. The Mitra and Associates of Bangladesh implemented the survey. ICF International of Calverton, Maryland, USA, provided technical assistance to the project as part of its international Demographic and Health Surveys Program (MEASURE DHS). No data was collected without prior permission. An interview was conducted only if the respondent provided their verbal consent in response to being read out an informed consent statement by the interviewer. The NIPORT took ethical approval for the survey from the Bangladesh Medical Research Council (BMRC). BDHS data set was available at https://dhsprogram.com/data, and the instructions were strictly followed for using the data.

Consent for Publication

Not applicable.

Availability of Data and Materials

The dataset (BDHS 2014) used in this study is publicly available on the DHS website (https://dhsprogram.com/data/dataset/Bangladesh_Standard-DHS_2014.cfm?flag=0).

Competing Interests

The authors declare that they have no competing interests.

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Authors' Contributions

MZA conceptualized the study. With the consultation of MSI, MZA completed the analysis. MZA and MSI drafted the manuscript. Both authors reviewed the draft manuscripts. After reading thoroughly and carefully, both authors approved the final manuscript.

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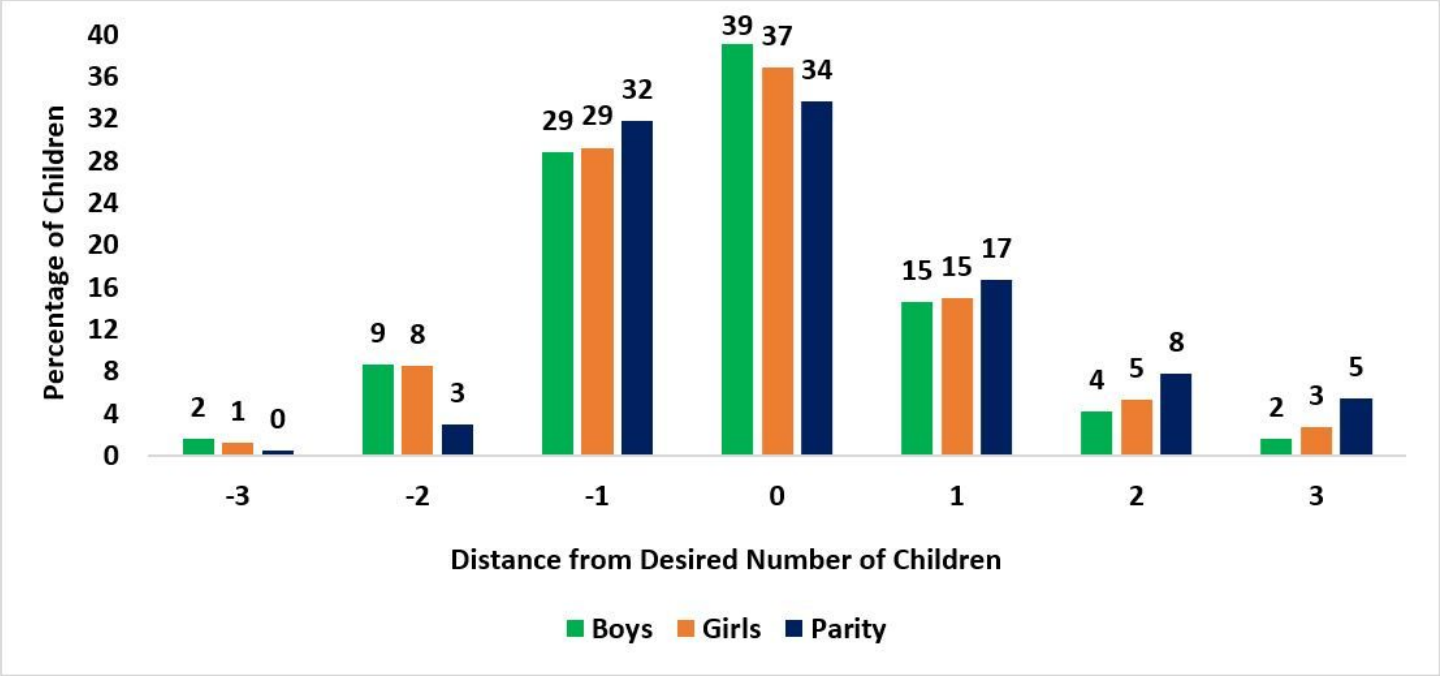
Figures



Note: 0 indicates less than 0.5%.

Figure 1

Percentage of live-born children by distance from the desired number of children

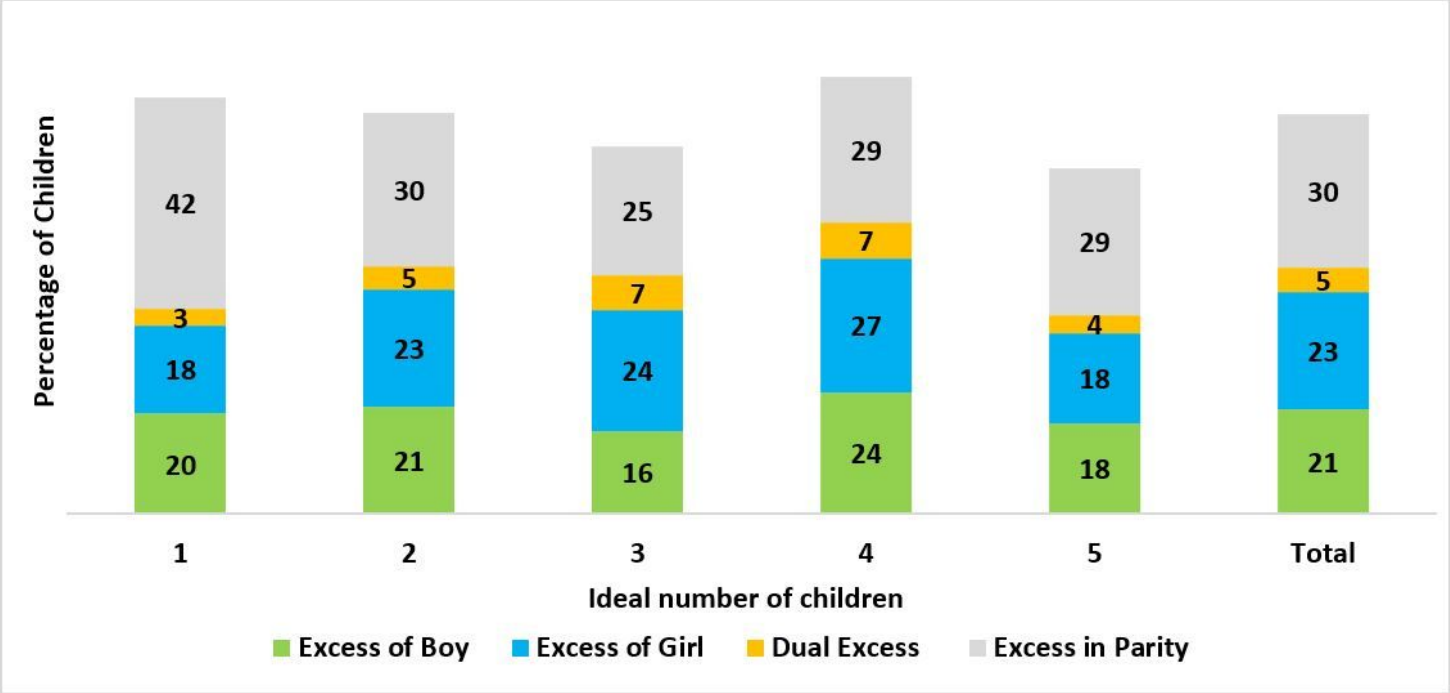


Figure 2

Percentage of undesired children by types of undesirability

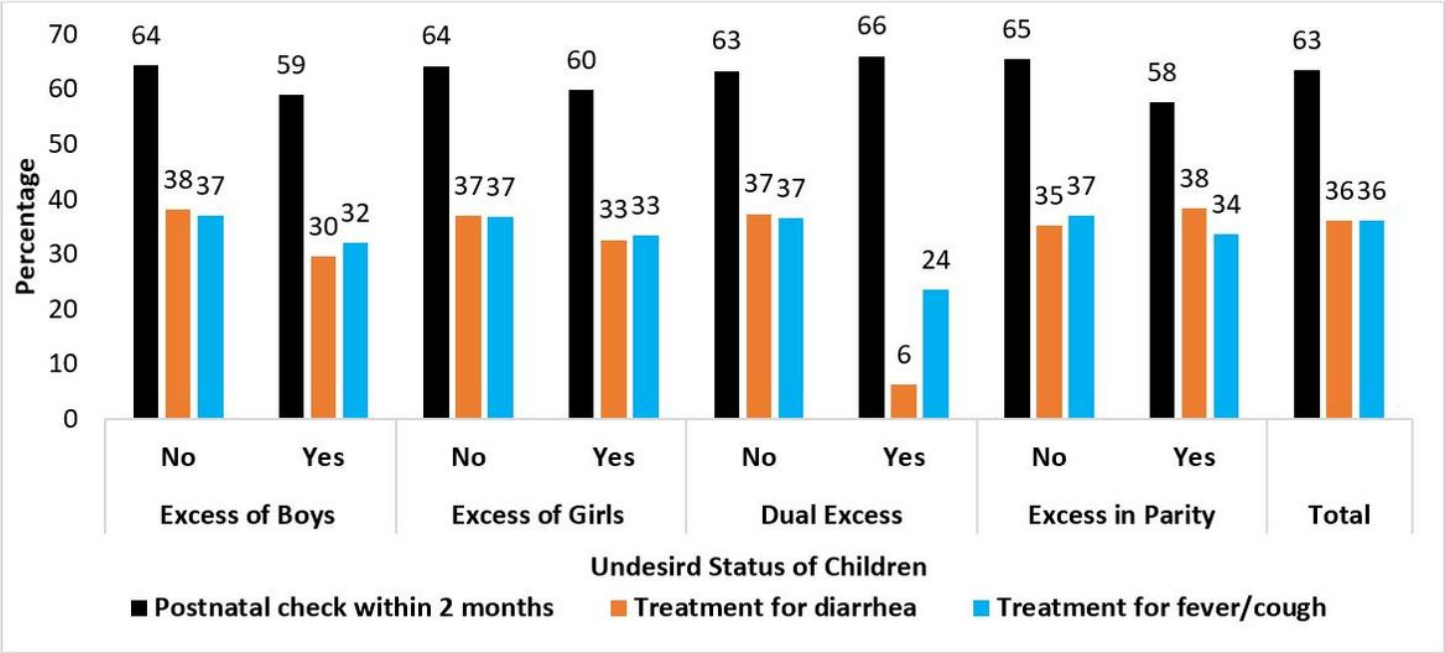


Figure 3

Seeking Postnatal Checkup for Baby within 2 Months and Medical Treatment for Common Illnesses by Desired Status of Children in Bangladesh

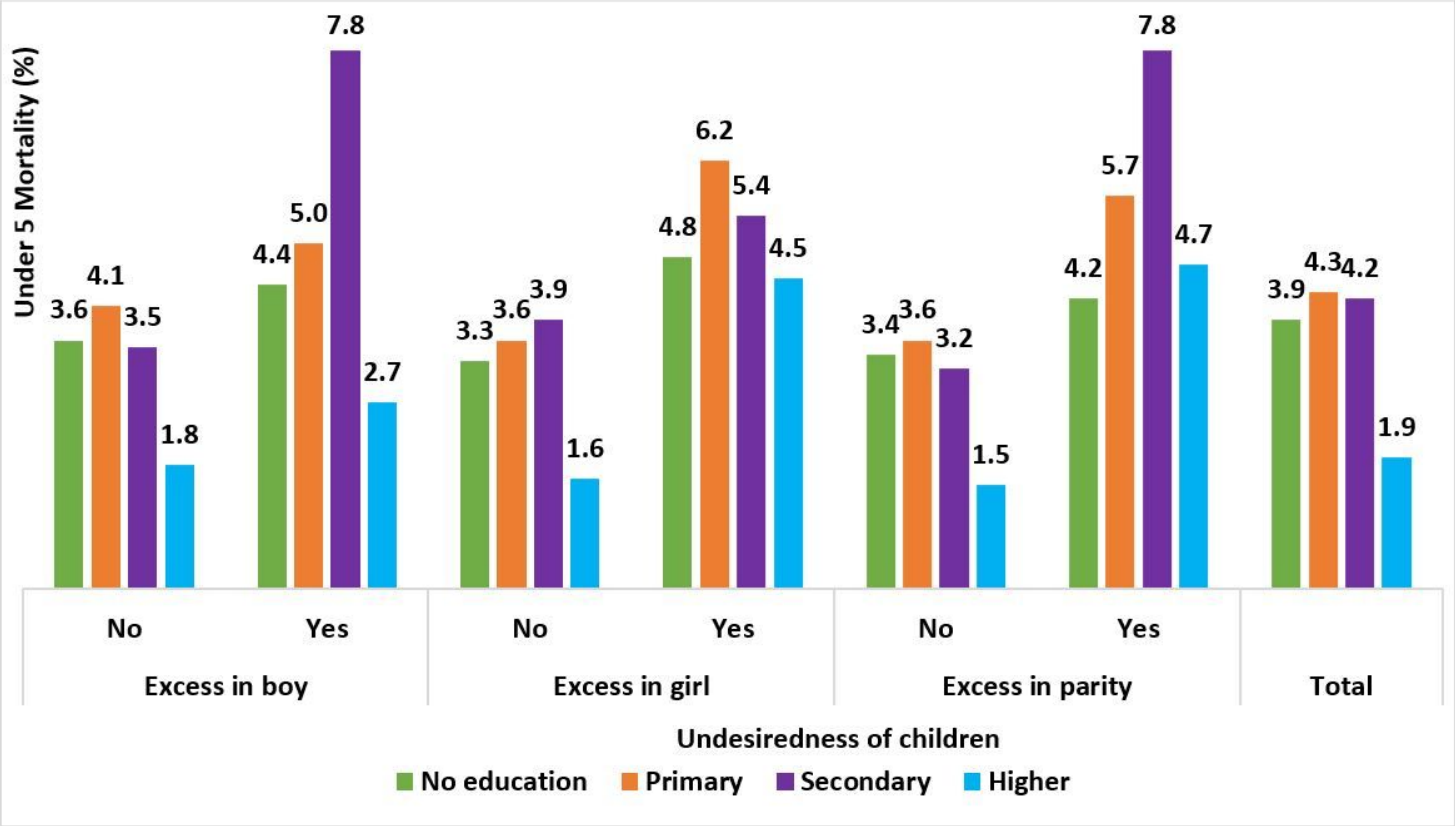


Figure 4

Percentage of under-five mortality rate attributable to undesired children by educational attainment

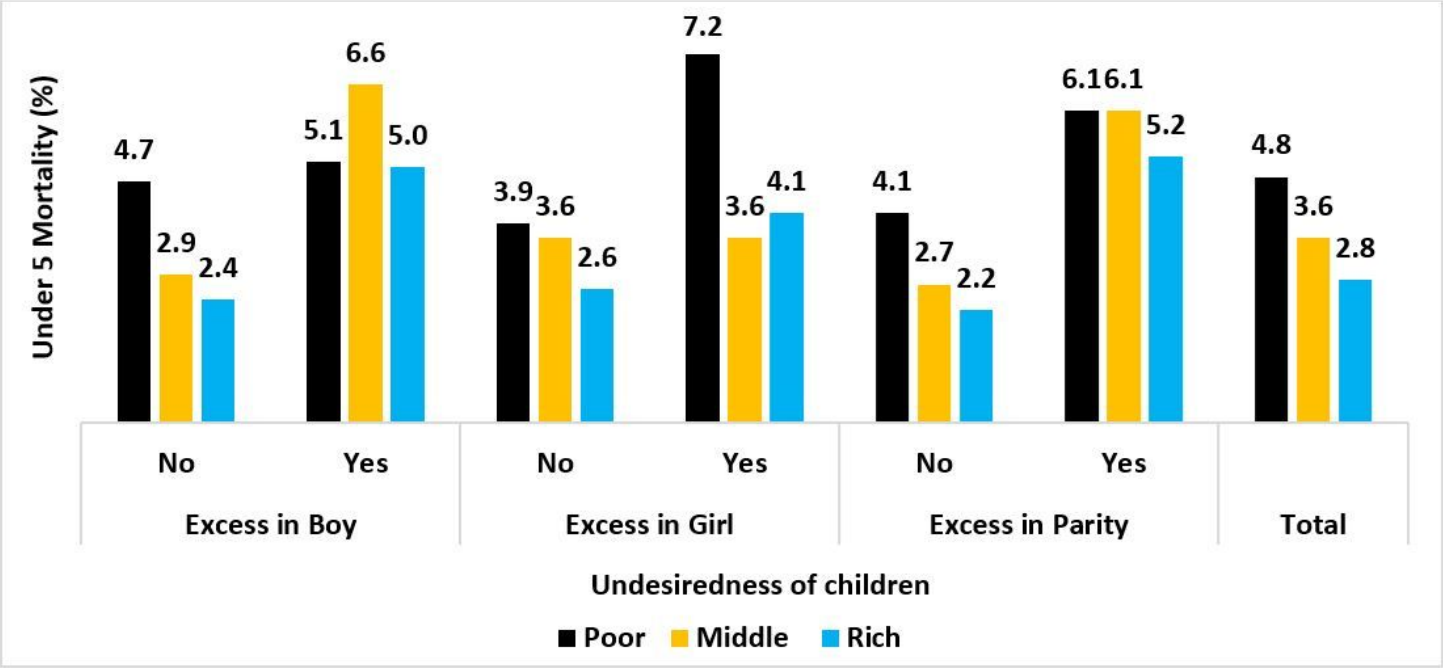


Figure 5

Percentage of under-five mortality rate attributable to undesired children by household wealth index

Supplementary Files

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- SupplementaryTable27October2020.docx