

The Impact of Women's Education on Maternal and Child Health Outcomes in Bangladesh: A Systematic Review

Most Amina Ferdos¹ and Mohammad Tarequul Islam²

Abstract

Background

Bangladesh is a promising nation in South Asia with a large number of populations in a limited land. Due to substantial economic and social development in the last two decades, Bangladesh prepares to graduate from the LDCs category. During this time, Bangladesh has seen broad-based gains in female education as well as considerable improvement in maternal and child health. Therefore the present systematic review has been conducted to expose the impact of women's education on maternal and child health.

Methods

The study followed the PRISMA principles for reporting a systematic review with PICOS techniques, and quality assessment using the National Heart, Lung and Blood Institute (NIH) tools and AXIS methods.

Results

The systematic review selected 25 studies out of 1729 potential articles. The research showed that female education was substantially influential and positively associated with present maternal and child health outcomes in Bangladesh. The study noted the frequency of stunting, underweight and wasting was much lower among children of mothers who had secondary or higher education in comparison with children of mothers who had primary education or no schooling. An increased level of women's education led to them in better access to ANC, PNC and SBA services that ultimately contributed to decreasing maternal and child mortality and improving overall maternal and child health.

Conclusion

The systematic review revealed that female education had played an imperative role in the advancement of present women and child health in Bangladesh. The study findings also recognised female education increased cognitive skills, advanced economic opportunities, supported healthier choices during pregnancy and enhanced health-seeking behaviour for mother and children, which re-enforced better maternal and child health outcomes.

Keywords: Bangladesh, Education, Maternal and Child Health, Mother, Women

Date of Submission: 02-11-2022

Date of Acceptance: 14-11-2022

I. Introduction

Education as a Determinant of Health

Educational attainment has been recognised as a strong social determinant of health for quality of life (1). Moreover, education can reshape life by influencing social and psychological factors like greater perceived personal control which has been associated with better physical and mental health (2). Education is not just about what is erudite in the classroom; it is additionally about the entryways of the other factors later in life that contribute to future health and wellbeing. Further access to education unlocks the better opportunity in employment and housing and promotes the healthy behaviours of individuals (3-6). Impact of education on health shows mostly in two ways; first of all, education facilitates children to learn knowledge specifically about their own body and health; and secondly, the educational practice provides information and realistic thinking that allows children to practice a healthy lifestyle. Additionally, educational process enables students to obtain knowledge and to build up attitudes and skills which finally form human capital for individual and social development (7). Education is also associated with health literacy. Health literacy is the understandings people encompass about their wellbeing and how to access general health care services and health information. People

¹ Dr Most Amina Ferdos, MBBS (RMC), DMU, MPH (University of Glasgow, UK), Public Health Expert, Medical Officer, Rajshahi City Corporation, Rajshahi, and Consultant Sonologist, Islami Bank Medical College, Rajshahi, Bangladesh. <https://orcid.org/0000-0002-6099-8330>, Email: ferdosauk@gmail.com (Corresponding author)

² Mohammad Tarequul Islam, MS (BAU), MA in Conflict, Security and Development (University of Bradford, UK), Commandant (SP), In-service Training Centre, Rajshahi, Bangladesh. <https://orcid.org/0000-0003-3293-2462>

need to comprehend the health information they are provided with to take manage of their health (8). Research on the social determinants of health (SDH) indicates 'education' provides ample knowledge and information which also have an immense influence on all other socio-economic characteristics (09). Moreover, education has an extensive influence of an individual's knowledge, behaviours, attitudes and skills, which play a vital role in health consciousness to prevent vector-borne infectious diseases. Therefore Individuals with the lowest educational levels consistently shows worse health and a greater level of disadvantage in access to health care (10, 11,). Furthermore, education is more likely to be linked to income, employment, and career success which directly associated with a person's health and wellbeing. Higher education offers better options to employment, improve relative health with higher autonomy and authority in the place of work and promote healthier lifestyles. Therefore education has a substantial influence across the life course from childhood to older age (09).

However Research shows women having formal education significantly contribute to reducing maternal, infant and child mortality in developing world and these interrelations have firmly established in public health in last few decades (12,13). Study showed the evidence for causal links between education and maternal and child health, which suggested that advancing female education played a significant role in improving public health settings in underdeveloped countries (14). Public health settings consider the people engagement in regular activities where social, environmental, personal and organisational factors are being interacted to affect public health and wellbeing. Besides this female education not only improve only the women's health; however, educated women acknowledge for ensuring a better start for children and support their families as well as promote social and environmental determinants of health (15) .

Furthermore, children survivals are the vital pointer of community steps forward and remain a considerable challenge for underdeveloped countries. According to WHO global child death rate has declined significantly since 1990, but still now per year, about 39 children die before their 5th birthday per year (per 1000 live births) (16). However, most child death occurs (under 5) in developing nations which experienced a more inadequate literacy rate, especially in women. Research shows female education is the benchmark and decisive cause in dropping child mortality (17). Gakidou et al. mention that the increase in female education could be accounted for more than half (50 %) of the global decrease in child mortality between 1970 and 2009 (18) . Providing fundamental formal education, particularly to girls, are significant movements for recent progress of global maternal and child health outcome. Female education likewise helps to fabricate the sort of practices and propensities that positively affect the family's wellbeing. Further, an increasing number of female access to schooling is the building block for raising the efficient women health worker, who may more supportive of maternal and child health (19) . Overall women education boosts the women for health-seeking manners for herself and her child. Female education gives confidence her to marry more educated husbands, promote the use of parental care, and support healthier choice during pregnancy which finally re-enforce better maternal and child health outcomes of the country (20, 21). Therefore women education and maternal health and child health are interrelated issues.

Female Education with Maternal and Child Health Scenario in Bangladesh

Bangladesh is a promising nation of South Asia with a large number of population (163.046 million) in a limited land (147,570 sq km) which is considered one of the most densely populated countries in the world. Due to substantial economic and social development in last few decades, Bangladesh is graduating from Least Developed Countries (LDCs) category and track for developing country by 2024 (22) . In 80s Bangladesh has treated one of the undermined countries in regards to education, poverty and health status. However, in recent years Bangladesh achieved significant progress in health, education, agriculture and economic sector. Present information from World Bank shows life expectancy (72.32%), adult literacy rate (73.91), under-five child mortality (30.3/1000 live births), maternal mortality (173/100,000 live births) and per capita food production have improved significantly in the last two decades. Simultaneously over that time, Bangladesh has advanced substantially in female education as well as improvement of maternal health and child health (22) .

However, gender inequality in education is a massive issue in many developing countries in Asia, Africa, and Latin America, even in Europe. Due socio-cultural issues and economic deprivation, female were much deprived of education until the 1970s in under-developed countries, which had a vast depressing social, economic and health effect in different countries, and Bangladesh is also one of them. Educating of girls in Bangladesh was largely devalued before the 1970s, due to patriarchy nature of society, cultural barrier and religious superstition. So their role for development for the family or community was also limited later in life, especially in health. During the early 1990s, Bangladesh has initiated a series of programme to promote female education for better health and economic outcomes. Consequently, since 1990 Bangladesh has seen to narrowing the gender gap in education and a sound improvement in enrollment, to equal access to schooling (23). Data shows Bangladesh has achieved a significant rise in enrollment for girls in primary and lower-

secondary schools in the last three decades. Moreover, in 1998 girls enrolment for secondary school was only 39% which has jumped to percent in 2017(24).

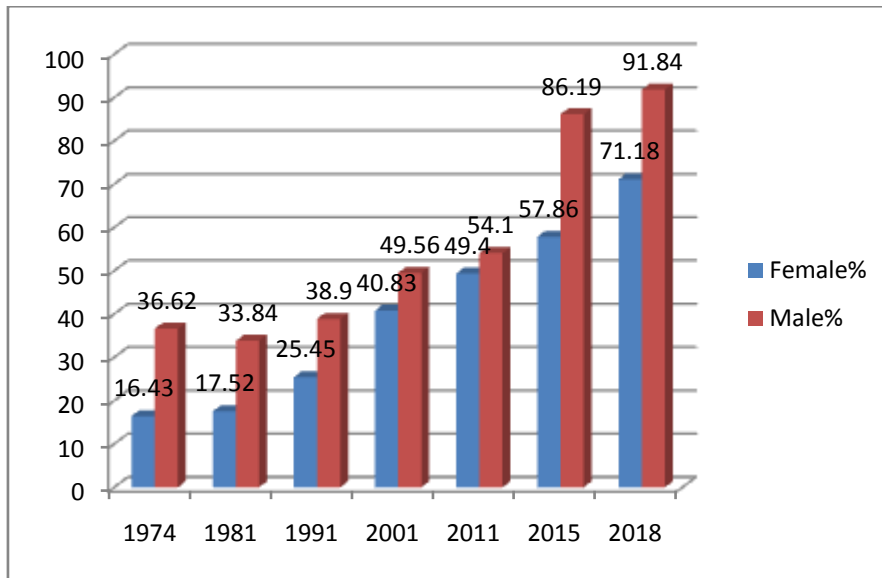


Figure-1: Comparative women and men literacy rate in Bangladesh (25)

As a result, the total adult women literacy rate of Bangladesh has jumped significantly (near to three times higher) in the last three decades (25% to 71%) (Figure-1). Simultaneously female youth literacy also considerably increased (about three times) over the previous three decades (25) (Figure.-2).

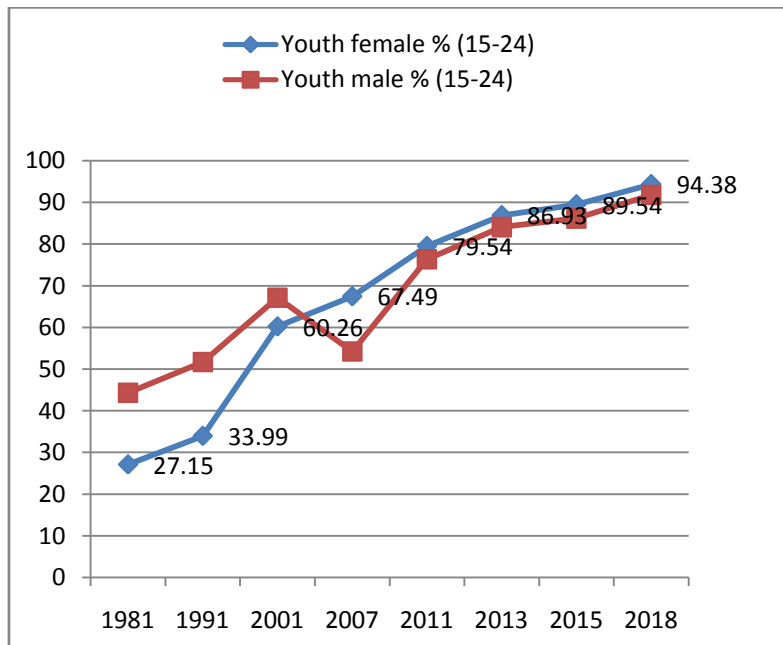


Figure-2: Literacy rate of youth female (15-24) (25)

According to the Ministry of Education, Bangladesh, presently, 98.66% girls are enrolled in primary school, and .15% enrolled in secondary school (26). Additionally, the school-based programmes emphasising the health-related issues like menstrual management, separate sanitation facilities for girls, and offer cash incentives to female students for attending the school. As the national policy of 'Prioritising girls' education seems to be the first crucial step to, social, public health and economic development in Bangladesh. However, this policy was widely supported by the Millennium Development Goals and NGOs and international actors in Bangladesh (23, 25). In recent year girl's enrollment and completion rate in secondary level chronologically increased. The study showed in 2016 and 2017 the enrolment rate in secondary level for girls was 66.8% & .1%

as against 54.4% and 54.2% for boys respectively; and the completion rate, for girls were 61.4% and 61.6% respectively (26).

Research shows Bangladesh also obtained a tremendous positive impact on women education, especially in the health and economy of the country. In the last 30 years, Bangladesh has been experiencing simultaneous improvement in women education as well as maternal and child health in Bangladesh. Figure-3 illustrates the increased outline of education with the declining view of maternal and child mortality (23,25,26).

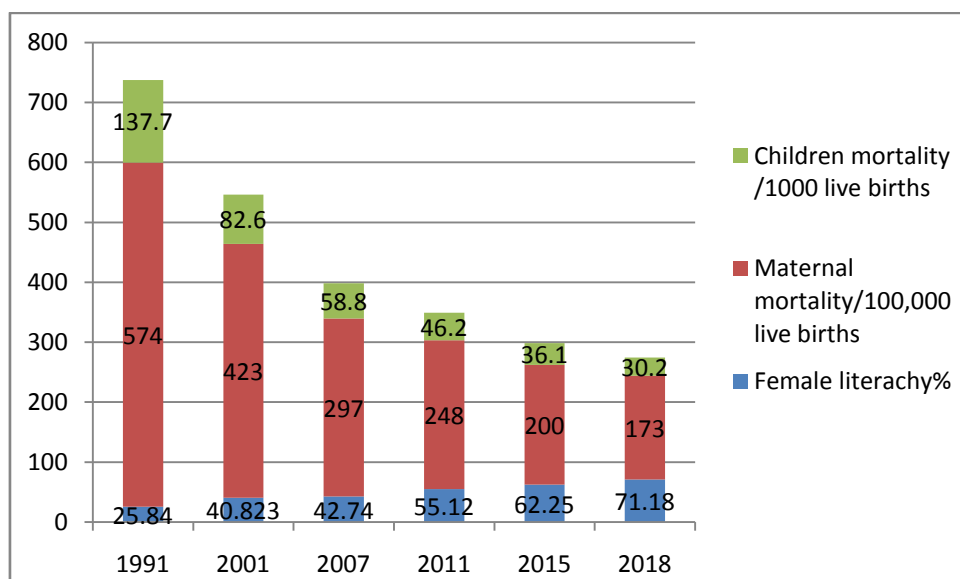


Figure-3: Increased women literacy with decreased maternal and child health (25) According to UNICEF under-five child mortality rate (U5MR) has decreased from 143.8 (in 1990) to 30.2 in 2018 (27), and during this time maternal mortality in Bangladesh has substantially declined from 574/100,000 to 173/100,000 LBs (28). Besides, children stunting is a vital indicator of a country's child health status. Further figure 4 indicates the increasing pattern of women literacy (25.35% to 71.18%) with the declining trends (73.6% to 30.8%) of child stunting (25).

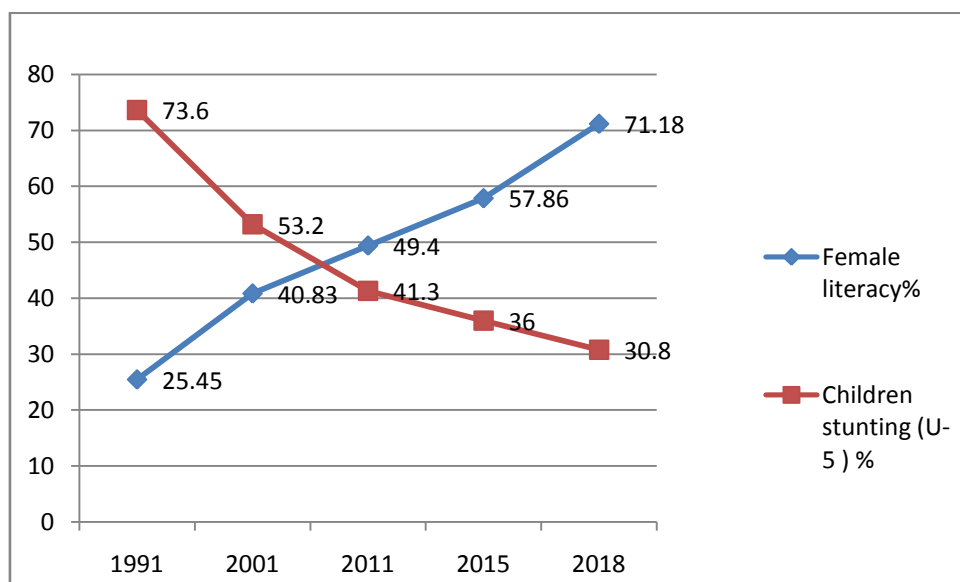


Figure-4: Female literacy and childhood stunting in between 1991-2018 (25)

Thus the above mentioned chronological data reflects the comparative view of female education with the improvement of maternal and child health. Therefore, female literacy seems too interrelated with maternal and child health enhancement in Bangladesh. The study provides an initiative about female education which has played a considerable role to boost and reinforce the public health of Bangladesh, particularly in maternal and child health progress. However, national and international strategy and policy documents show female education, maternal health and child health are associated issues (18,19,21). Nevertheless, a systematic review

of the impact of women education on maternal health and child of Bangladesh has not yet been carried out. Therefore in this aspect, the study is logical for the national interest of Bangladesh and provides a strategy for the policymakers.

II. Study Aims and Research Questions

The proposed research is carried out with a view to exploring the impact of women education in improving maternal health and child health status in Bangladesh.

Specific research objectives:

- To critically review the impact of female education on maternal health components like maternal mortality, access to health-care service during pregnancy, antenatal care, postnatal care and maternal nutritional status.
- To review the influence of female education in child health components like stillbirth, child nutritional status, child stunting, access to health care service and child mortality, in Bangladesh.
- To discuss the contrast between an increase of female education with the advancement of major maternal health and child health components.

Research questions:

Research question 1: To what extent female education contribute to possible positive outcomes in promoting maternal health in Bangladesh?

Research question 2: How does female education influence to improve child health status in Bangladesh?

III. Study Methods

Systematic reviews have gotten logically significant in public-health situations. The strategy depended on the outline of the research, which offered a proof-based answer in health and general wellbeing study. The study considered PRISMA procedure for systematic review which is the preferred and the most popular reporting protocol ((29, 30). The study considered data from cross-sectional studies, randomised control trials, case-control studies and cohort studies. Moreover, secondary data such as national and international report and documents also used in this thesis. However, other studies such as systematic reviews, non-academic literature (like editorial, short study, comments, guidelines, etc.) were excluded, though these kinds of literature contain sufficient data and information. Pieces of literature where access to full texts was not available also excluded in this thesis.

The study considered the search for the last 20 years from 12 May. In this systematic review, the electronic literature searches were conducted via the following database-

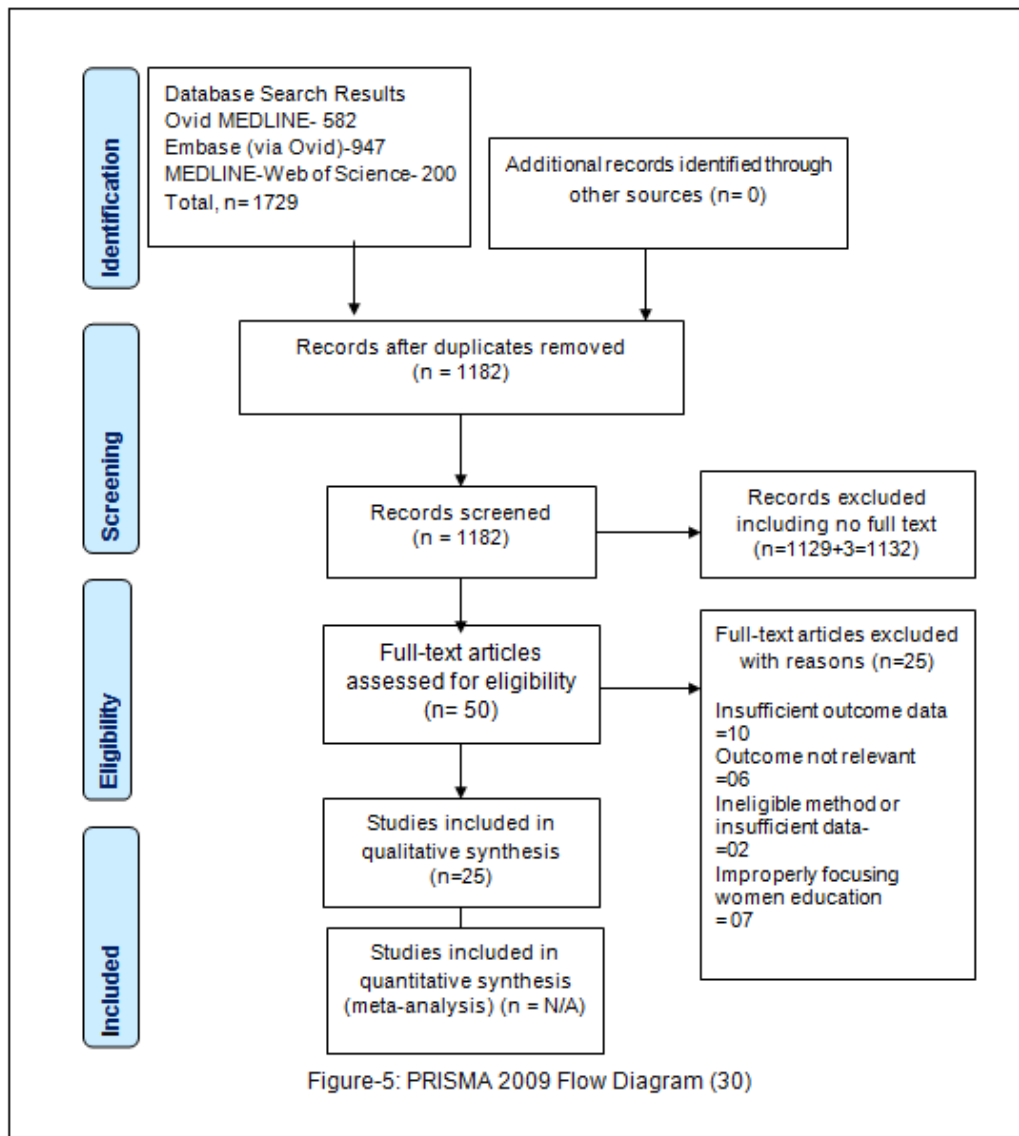
- Ovid MEDLINE (R) (1946 to April week 5, 2020)
- Embase (via Ovid) (1947 to Present updated daily)
- MEDLINE- Web of Science (Web of Science Core Collection)

The study largely considered to search Embase and Medline due to their comprehensive database flexibility and exposure of public health and medicine which allowed searches more diverse (31). Further Google Scholar also used to performing to search the grey literature to decrease the publication bias and amplify the review's comprehensiveness, suitability and promote an impartial picture of available facts (32). The study followed the quality assessment tool of the National Heart, Lung and Blood Institute (NIH) for case control studies. The tools were intended to help analysts in concentrating on ideas that are key for basic evaluation of the internal validity of literature. The tools were explicit to specific categories of included study design (33). The study mostly used AXIS tool and follows Delphi Methodology for quality assessment of the included cross-sectional and cohort studies (34). Following the PRISMA protocol in the systematic review, sometimes meta-analysis is appreciated. However due to vast heterogeneity of the included literature, the present study did not consider meta-analysis (35) and only systematic review had performed.

The study considers maternal health outcome means, maternal nutritional (anaemia and vitamin A) deficiency; access to maternal health service (antenatal and postnatal care, skilled birth attendant during delivery and institutional delivery) ; maternal mortality and maternal age (age of first childbirth). Besides child health outcome includes stillbirth; nutritional status of under 5 children (including stunting, wasting, under-weight and anaemia); access to child health-care service (antenatal and postnatal care vaccination, diarrhoea and illness); child Mortality (including neonatal and infant). The study considered women means ever-married female (married at least once) of childbearing age or pregnant or women having child/children. Though internationally accepted female reproductive age belongs to 15-49, but the study did not impose any limit for maternal age. Consequently, Bangladesh has one of the highest adolescent fertility rates in the world, where 1 girl in 10 having a child before the age of 15 (36, 37). So some literatures used only mother or married women, not to indicate their age. On the other hand, the review considered child means child/children up to 5 years and men indicated as the fathers.

IV. Results

The systematic literature search identified 1729 potential articles which were imported to Endnote. These included 582 articles from Ovid Medline, 947 articles from Embase (via Ovid) and 200 pieces of literature from Medline –Web of Science. Based on recorded title primarily 547 materials were removed from the search due to duplication. After screening the title and abstract total of 1132 articles were excluded from the review. Out of 1132, overall 1129 literatures were excluded on the basis of intervention and 3 studies were removed not to found the full text. This exclusion provided 50 articles for full-text screening. At the last stage of selection, 25 materials were excluded for not having illegible criteria. Finally, the study selected 25 potential articles (38-62) which meet all the illegible criteria for the systematic review. The PRISMA 2009 Flow Diagram for selection process showed in Figure 5.



The study considered 25 pieces of literature for systematic review, which were conducted between 2000 and 2020. The key characteristics of the individual studies are showed in Table 1.

Table-1: The key characteristics of the 25 selected studies

Sl	Author	Year	Country	Study design	Main objectives	Participants	Basis of the sample /data
1	Abir et al. (38)	2017	Bangladesh	Cross sectional study	Examined the latent predictors of stillbirths in Bangladesh	Women (pregnancies over 28 weeks) 29094	Bangladesh Demographic and health survey (BDHS) data 2004, 2007, 2011, 2014
2	Ahmed et al. (39)	2003	Bangladesh	Cross sectional study	Explored the occurrence of anaemia and vitamin A deficiency (VAD) and checked the relationship of socio-economic and dietary factors among pregnant women	Women (Pregnant) 383	researcher own survey/study in 1998
3	Akter et al. (40)	2015	Bangladesh	Cross sectional study	Assessed the association between parental education and under-five mortality and investigate the association had changed over time	Children 38544 (under five years)	IMCI (Integrated Management of Childhood Illness) household survey 1995-2000 and 2002-2007
4	Ali et al. (41)	2019	Bangladesh	Cross sectional study	The research aimed to recognise the nutritional statuses and current model of dietary diversity score (DDS) among children (6–59 months) and their relations with diverse personal and family factors in Bangladesh.	Children 6468 (between 6–59 months)	researcher own community household survey 2014
5	Bhowmik et al. (42)	2020	South and South East Asia including Bangladesh	Cross sectional study	The study evaluated the development of low- and middle-income countries from South and Southeast Asian (SSEA) region in skilled health attendants (SBA) coverage and appraised the contribution of women's education in this succession	Women 1,171,731	Demographic and health survey from 10 Southeast Asian countries
6	Bhowmik et al. (43)	2019	Bangladesh	Cross sectional study	The article investigated the socio-demographic factors connected with the Antenatal care (ANC) and skilled birth attendants (SBA) service attainment.	Women 4603 (had at least one live births)	BDHS data 2014
7	Chakraborty et al. (44)	2003	Bangladesh	Cross sectional study	Explored the factors allied with the use of maternal health care services in Bangladesh	Pregnant women 993	Bangladesh Institute of Research for Promotion of Essential & Reproductive Health and Technologies (BIRPERHT) survey 1996 on maternal morbidity in Bangladesh
8	Chowdhury et al. (45)	2017	Bangladesh	Cross sectional study	Identified the trend and shifting pattern of socio-economic inequalities in child mortality (U-5) in rural Bangladesh and considered the effect of mother's education in reducing socio-economic inequalities	Children 4738 (under 5)	BDHS data 1993, 1996, 1999, 2004, 2007, 2011, 2014
9	Chowdhury et al. (46)	2015	Bangladesh	Cross sectional study	The study intended at considering the factors linked with anaemia among pregnant mothers	Pregnant women 224	researcher own survey in 2014
10	Chowdhury et al. (47)	2007	Bangladesh	Cohort Study	Examined and compared trends in maternal death with separate analyses of causes of death, underlying socio-demographic determinants, in which interventions differed.	Man and Women total 220,000 (inhabitants)	ICDDRDB data between 1976 and 2005
11	Chowdhury et al. (48)	2018	Bangladesh	Cross sectional study	Identified the national and regional occurrence rates of underweight and severe underweight in	children 17133 (less than 5 years)	Bangladesh Multiple Indicators Cluster Survey (MICS) by Bangladesh Bureau of

					Bangladesh, and examined the relationship of socio-economic and demographic factors with children underweight		Statistics and UNICEF 2012-2013
12	Giashuddin et al. (49)	2003	Bangladesh	Cross sectional study	Examined the breast feeding practice and considered the factors effect on nutritional status of the children (0-24 months)	Children 2781 (less than 5 years)	'Surveillance on Breastfeeding and Weaning Situation and Child and Maternal Health in Bangladesh' 1998
13	Hahn et al. (50)	2018	Bangladesh	Cross sectional study	Examined the impact of female education on marriage outcomes with considering the school girls stipend programme	Women 18,000 (ever-married)	BDHS data, 2007, 2011, 2014
14	Hasan et al. (51)	2018	Bangladesh	Cross sectional study	Explored the changes in the association between potential covariates and nutritional status of children over time.	Children 36,252 (under 5)	BDHS data 1997 to 2014
15	Hasan et al. (52)	2016	Bangladesh	Cross sectional study	Determined the long-term impact of maternal education on malnutrition in children-U5 and quantified the period of schooling required for the mothers to reduce the risk	Children 28941 (U-5)	BDHS data 1996, 1999, 2004, 2007, 2011.
16	Hossain and. Khan (53)	2018	Bangladesh	Cross sectional study	Explored the association between parental education and childhood under-nutrition in Bangladesh	Children 7173 (under 5 years)	BDHS data 2014
17	Huq and Tasnim (54)	2007	Bangladesh	Cross sectional study	Examined the influence of maternal education on health status and the utilisation of child health-care services in Bangladesh	Children 4387 (under 5 years)	Household Income Expenditure Survey 2000 by BBS
18	Kamal (55)	2015	Bangladesh	Cross sectional study	investigated the effect of adolescent motherhood on neonatal mortality in Bangladesh	10 996 women and 3771 men	BDHS data 2007
19	Kamal et al. (56)	2012	Bangladesh	Cross sectional study	Explored the risk factors of neonatal mortality in Bangladesh	10996 ever-married women, 3771 men and 6058 Children	BDHS data 2007
20	Mistry et al. (57)	2018	Bangladesh	Cross sectional study	Research explored individual-, maternal- and household-level factors associated with stunting among children under 2 years	Children 6539 aged 0–23 months	nationwide health care survey 2016 by BRAC
21	Nahar et al. (58)	2013	Bangladesh	Case control Study	To estimate the prevalence of, and risk factors associated with, stillbirth in a developing population.	Women 695 with stillbirth and life birth	the record (2008-2009) of NGO 'Manoshi Programme.'
22	Puglisi and Busetta , (59)	2019	Bangladesh	Cross Sectional study	Determined the effect of education on child mortality in individual and community level.	Children 32847 (U-5)	BDHS data 2014
23	Rahman et al. (60)	2019	Bangladesh	Cross sectional study	Examined the relationship of malnutrition with anaemia by conducting separate analyses for children (U-5) and women of reproductive age	Women 24 (15-49 years) and Children 2283 (6-59 month)	BDHS data 2011
24	Semba et al. (61)	2008	Bangladesh and Indonesia	Cross sectional study	Explored the outcome of length of maternal and paternal education on stunting in children of less than five years.	Families from Indonesia 590,570 and Bangladesh 395,122	Nutritional Survey of Indonesia (2000- 2003) and Nutritional Survey Bangladesh (2000-2005)
25	Yaya et al. (62)	2017	Bangladesh	Cross sectional study	Determined the occurrence of institutional delivery services and explored the factors connected with their utilisation in Bangladesh	Women 7313 (15 and 49 years)	BDHS data 2011

Participants of the included study were mostly women (Mother) and children, and some literature also included men (Father). However, the systematic review only focused on women and children as population. In total, 23 kinds of literature indicted as cross-sectional study (CSS) design, one belonged to the cohort (10), and another one followed case-control study design (21). The present review indicated education as the only intervention. In this review education considered as formal education up to X class/10-grade pass or Secondary School Certificate (SSC) pass/equivalent in Bangladesh. Here, formal education means a structured and systematic form of learning system (primary and secondary) in Bangladesh. However, the included literature also discussed some other socio-economic deterrents for maternal and child health, but the review concentrated on female education and its effect on maternal and child health.

All the included studies were assessed for risk bias. Out of 23 cross sectional studies, 14 studies considered as good/high quality with low-risk bias and 09 studies belonged to fair quality. Besides, one cohort study (47) and one case control study (58) also assessed as high quality. Out of 25 pieces of literature, 22 articles based on secondary data, where 12 literatures used data from nationally representing BDHS survey information at different times, and 10 literatures used data from other secondary sources. Only three studies based on primary data and found as the high-quality article. However all the literature sincerely addressed the objectives and research questions; methods; study population; risk factors and outcome variables; appropriate tools that were tested and published previously to explore the exposure and outcome; and, discussion and conclusion to justify by the results.

V. Discussion

Maternal Health

In total, 9 pieces of literature discussed the different indicators of maternal health. The systematic review unveiled that female education significantly associated with maternal anaemia; skilled birth attendant and institutional delivery; antenatal and postnatal care and maternal mortality. During pregnancy, maternal anaemia was a predominant problem of women in Bangladesh since the 1970s. Three studies (39, 46, 60) indicated that female education was a high influencing factor to improve the maternal anaemia in Bangladesh. They mentioned increasing the levels of education for women also decrease the stage anaemia. Where Ahmed et al. (39) observed $p=0.02$, Chowdhury, et al. (46) mentioned $p=0.002$ and Rahman et al. (60) showed adjusted OR (95% CI)= 1.22(1.03–1.45). Researcher Agarwal et al. (63) Al-Mehaisen (64) and Ny et al. (65) demonstrated a similar result in India and Jordan.

Female education is a significant predictor of mother access to the skilled birth attendant and institutional delivery. The review observed higher levels of education for women (primary, secondary and higher) significantly increase the scope of mother entrance in hospital and skilled birth attendant during delivery. A comprehensive and elaborate study on 10 South East Asian Countries including Bangladesh by Bhowmik et al. (42) found mother having primary, a secondary and higher level of education showed 1.65, 2.21 and 3.14 times more likely to access SBA. Bhowmik et al. (43) also found similar results. Besides, ANC and PNC are two vital components of maternal health which directly enhance to improve the maternal and child mortality. Three researchers, namely Bhowmik et al. (43) Chakraborty et al. (44) and Hahn et al. (50) showed female education significantly promoted pregnant women to access in health care services. Access to ANC, $p=0.035$ for primary education, and $p<0.001$ for secondary education (43), another two studies showed $P<0.01$ for secondary education (44, 50). According to UNICEF, women access to maternal health has considerably influenced by women education in Bangladesh. The study observed only 17 percent of mothers with no education had access to SBA and ANC, compared to 30 percent with primary education and 79 percent for mothers with higher education (66). However, these studies also addressed husband education, and family affordability was too crucial for ANC, PNC and SBA. Further, international study in Ethiopia (67), India (68) and Nigeria (69) as well mentioned that female education significantly promoted the ANC, PNC and institutional delivery services to pregnant women.

Then come to maternal mortality, one of the most significant indicators of maternal health status. The review showed a total of 8 literature mentioned that female education had a significant contribution to reduce maternal anaemia and enhanced to access ANC, PNC and SBA, which had a vital role in reducing maternal mortality in Bangladesh. One research by International Health Research Organisation ICDDR'B elaborately described the importance of women education on maternal mortality in Bangladesh. Research showed maternal mortality was more or less stable between 1979-1989. Since 1990 the speed of maternal mortality has declined rapidly due to the swift increase of female education and ANC and SBA service during pregnancy in Bangladesh (47). They showed educational differentials for mortality were highly considerable; the crude OR (95%CI) for over 8-Grade formal education compared with no formal education was 0.30 (0.21–0.44) for maternal mortality and 0.09 (0.02–0.37) for abortion mortality. The study also unveiled that abortion mortality was 11 times higher in women without schooling than in those who were highly educated (above 8-grade education). However, research also showed abortion frequency were more in educated women than illiterate

women. Nevertheless higher educated women suffered very few in cases of abortion complications, and they have more access to health care for safe abortion and post-abortion care rather than illiterate women (47, 70).

The study observed since 1990, Bangladesh has an extensive improvement in access to ANC, PNC and SBA, which played a vital role to reduce obstetric death in Bangladesh. Educated mother suffered fewer abortion complications than uneducated mother and educational differences made wide-gap in maternal death for illiterate mother. Therefore female education had an enormous influence to reduce obstetric and abortion death in Bangladesh (70,71). Research showed the principle reasons for maternal mortality are pregnancy-related complexities, for example, toxemia, bleeding, infections and hazardous fetus removal/ abortion. The review recognised that educated women easily embrace basic and inexpensive available practices to keep up hygiene, are increasingly ready to respond to indications, for example, bleeding or hypertension, having more opportunity to updated themselves about abortion and place of abortion and additionally ready to acknowledge treatment and SBA, where education may conceivably cause decreased in maternal mortality (23). UNICEF explores that better-educated mother is, more likely to receive critical maternal health services during pregnancy which is more understandable to her and more comfortable to take healthy measures than poorly educated mother that rapidly move to improve overall maternal health (71) (99). International studies in Tajikistan (20), Nigeria (72), Thailand (73), Chad (74) and Peru (23), find the similar results that female education actively promotes the maternal health through reduce maternal mortality and increase women access to health care service during pregnancy.

Child Health

Child health is crucial to the nation's present and its future. Mounting substantiation that health through upbringing sets the phase for adult health not only strengthen this perception, but also generate a vital ethical, social, and economic imperative to make sure that all children are as healthy as they can be. Healthy children are more likely to become a healthy nation (74). Total 18 included literature pointed out about child health issues. The present systematic review conveyed that female education had a considerable association with child health (U-5) component: stillbirth, nutritional deficiency, access to child health care and child mortality.

In a developing country like Bangladesh, stillbirth remains a significant issue for measuring child health status. Data showed the pooled stillbirth rate was 25 in 2015 (per 1,000 total births) (66). Two studies Abir et al. (38) and Nahar et al. (58) showed a positive association between female education and stillbirth, and stillbirth rate was higher where those mothers had no schooling. Mothers having the secondary or higher grade of education (OR = 0.59, 95%CI: 0.43–0.82, P = 0.002) and those with primary level (OR = 0.66, 95%CI: 0.55–0.80, P < 0.001) were significantly lower probability for stillbirths compared to mothers with no schooling (38). However, both studies also observed maternal age and family affordability were too important factors for stillbirth.

Under-nutrition is a major threat to the child (U-5) survival and development in under-developed countries. Children have been suffering frequent stunting, wasting, under-weight and anaemia in Bangladesh due to malnutrition. Total 10 studies reported that female education had an optimistic association with children with malnutrition effect (Table-2). In analysing the review observed, the following six works of literature showed child stunting was notably associated with female education in Bangladesh.

Table-2: Association between maternal education and nutritional status (stunting)

Covariates Mother Education	Nutritional Status (U-5)- stunting							
	Ali et al. (38)		Giashuddin et al. (49)		Hasan et al.(52) (Adjusted risk ratio) RR (95% CI)	Hossain and Khan (53) RR (95% CI)	Mistry et al. (57) RR (95% CI)	Semba et al. (61) Adjusted OR (95% CI)
	OR	p-value	OR	95%CI				
No schooling	Ref							
Primary (Vs no schooling)	0.80	<0.05	1.69 (P <0.001)	1.33-2.15	0.99 (0.97 1.03)	0.96 (0-88, 1-05)	0.99(0-88, 1-10)	0-954, (0-951–0-957)
Secondary (Vs no schooling)	0.63	<0.000	1.47 (P <0.01)	1.13-1.90	0.86 (0.81 0.89)	0.93 (0-86, 1-01)	0.88(0-80, 0-97)	p<0.0001

In regards to child wasting, three literature (41, 52, 53) explored that increasing maternal education found to be protective against child wasting (Table-3).

Table-3: Association between maternal education and nutritional status (wasting)

Covariates Mother Education	Nutritional Status (U-5) –wasting			
	Ali et al. (41)		Hasan et al. (52)	Hossain and Khan (153)
	OR	p-value	RR (95% CI)	RR (95% CI)
No schooling	Ref			
Primary (Vs no schooling)	1.03	0.754	0.92 (0.85 1.00)	1.07 (0.88, 1.30)
Secondary (Vs no schooling)	0.95	0.585	0.82 (0.74 0.91)	1.07 (0.89, 1.30)

Besides 5 literature (41, 48, 49, 52, 53) mentioned children underweight also had a positive association with women education (Table-4).

Table-4: Association between maternal education and nutritional status (underweight)

Covariates Mother Education	Nutritional Status (U-5) -underweight					
	Ali et al. (41)		Chowdhury et al. (48),	Giashuddin et al. (49)	Hasan et al. (52)	Hossain and Khan (53)
	OR	p-value			RR (95% CI)	RR (95% CI)
No schooling	Ref	Ref	Ref	1.75 (P <0.001) 1.34-2.29	Ref	Ref
Primary (Vs no schooling)	1.03	0.754	0.96, (0.85–1.07)	1.35 (P <0.05) 1.01-1.80	0.97 (0.94 1.01)	0.99 (0.89, 1.09)
Secondary (Vs no schooling)	0.95	0.585	(0.64–0.93) (p < 0.01)	ref	0.83 (0.78 0.88)	0.96 (0.87, 1.06)

Moreover, female education had a reverse relation with children anaemia (50, 60). Rahman et al. (60) described that children anaemia were influenced by the level of their mother's education and the risk of child anaemia were lower of those women (mothers) who had higher schooling { Adjusted OR (95% CI)=1.34(1.13–1.59)}. Furthermore, children of mothers having above grade five education showed a 15% higher DDS (Dietary Diversity Score) with compared to children of mothers having no schooling {P-value for primary education 0.02, and secondary education 0.15}. The review observed educated mothers seemed to be better in knowledge, timing and practice of nutritional food and healthy behaviour rather than the uneducated mother.

The systematic research showed that children from the parents with no schooling or illiterate were significantly more malnourished than the children whose parents had a secondary or higher level of education (41, 50, 51, 60). However, three literature (41, 51, 61) emphasised for mother as well father education for better nourishment of the children (U-5). Further four studies (41, 49, 51, 60) also addressed family affordability or family income too important factor to maintain child nutrition. Moreover, some other research addressed that parental education accomplishment strongly allied with the nutritional status of their child. Because parents with higher education were better informed, leading to an increase in their awareness about nutritional issues affecting their children health (75,76).

Further, ANC and PNC are two vital issues for mother and newborn health. Antenatal care (ANC) indicated the risk in pregnancies and informed women so that they might positive pregnancy experience and healthier delivery. WHO recommends at least 8 ANC during pregnancy. Besides, PNC also critical for newborn, and most infant death occurs during this time. Therefore, WHO recommends postnatal care for all mothers and babies should be at least six weeks after birth (77,78). One detailed study by Hahn et al. (50) found women educational attainment were more likelihood of receiving ANC and PNC (Panel: B-IV results showed women education for ANC value 0.044, P <0.01 and PNC value 0.036, P <0.01).

On the other hand, female education was highly associated with Children illness, using health care facility, taken to a qualified health provider, diarrhoea and vaccination (54). Huq and Tasnim mentioned children of mothers with less education were more vulnerable to general illness and diarrhoea. They reported that children whose mother had below primary education suffered 19.9% in frequent illness and 9% incidence of diarrhoea. Besides children, those mothers were higher educated suffered 14.6% in illness (p=0.11) and 5.5% incidence of diarrhoea. However, children of an advanced educated mother had no occurrence of diarrhoea (p=0.05). Similarly, children of mothers with secondary education had higher access to receive service in the health care centre and qualified health provider, though they are not statistically significant. Female educational

attainment showed substantial differences in child (12-23 month) vaccination coverage (children of mothers with secondary level education OR=1.4, significant at <5% level and secondary plus education OR=6.3, significant at <1% level) (54). Vikram et al. also reported a significant association between women education and immunisation in India (79).

Child mortality is a vital indicator which reflects the overall health status of a country. Total 5 included literature showed women education was absolutely associated with reducing child mortality. Kamal (55) and Kamal et al. (56) reported a higher level of maternal education showed a lower risk of neonatal death in Bangladesh. International researcher Abuqamar et al. 2011 (80), Basu and Stephenson 2005 (81), Joshi et al. 2006 (82) observed the same association in Palestine, United States and India respectively. The systematic review exposed that there was a significant correlation between women education and child mortality (U-5) (40, 45, 55, 56, 59). Research showed that in 2002-2007 children of the mother having secondary education the odds of the U-5 child mortality were 38% lower in compared to the children with mother those had no schooling (P-value: <0.001). Moreover, mother having primary education, the U-5 child mortality was decreased by 16% and 28% in 1995-2000 and 2002-2007 periods, respectively (40, 45). Akter et al. (40) and Chowdhury et al. (45) and Puglisi and Busetta. (59) described father education also a considerable risk factor for child mortality, and the effect of father education on U-5 child death was statistically significant. They also addressed maternal education was more influential than parental education in context to child mortality. However, if parents were advanced educated, then there was no significant difference showed between father and mother education (above higher secondary level) (40, 45, 59). The results seem to be indicated that female education enhanced the women for health-seeking behaviour for herself and her child. Moreover, female education encouraged her to marry more educated husbands, promoted the use of parental care, and supported healthier choice during pregnancy which re-enforced better maternal and child health outcomes (50, 83, 84).

VI. Findings

The systematic review observes the risk of child morbidity and mortality decrease as the mother's level of educational attainment in Bangladesh. The study notes the frequency of stunting, underweight, and wasting is much lower among children of mothers having secondary or higher education in comparison with children of mothers having primary education or no schooling. Even higher maternal education is more influential than father education or lower parental education in the context of children malnutrition. However, the review indicates that a higher level of formal learning promotes women for the protective child care behaviour like vaccination in time, use nutritious food, provide Vitamins and use iodised salt. Some other researches Das S. et al (84), Siddiqi M.N.A. et al (85) Semba R.D. (86) describes higher level of maternal education encourage healthy life seeking behaviour. The review shows maternal education is highly significant for child survival and more influential than father education. So many international researches address similar results and where maternal education is widely acknowledged for child mortality (79,87, 88,89). Besides, the study reveals that educational levels (primary, lower-secondary, secondary or SSC pass and higher) for women are significantly associated with ANC, PNC and SBA service, where an increased level of education leads to better access to ANC, PNC and SBA services that ultimately contribute to decrease maternal mortality and improve overall maternal health.

The study believes that education has a positive effect on women's cognitive skills, improve their economic opportunities and status and increasing women's access to use of preventative and palliative antenatal and postnatal health-care which has boost maternal and child health (90, 91) in Bangladesh. Further, the study accepts as true that higher educated mothers are more likely to extra empowered and avail a level of autonomy thus they make the substantial decision on their own-health and child-health as well family-health related matters, and more scope to use of health care facilities, which may be piloted to superior health outcomes for mother and child (23, 87,92). The study results consider that female education is a proven and powerful investment in the health and well-being of present and future generations. Female education leads to improve the health both for mother and children and also for the family as a whole. Even female education contributes to policy changes for the betterment of health and education. The results show women having secondary education or higher education have higher access to ANC, PNC and SBA and having less pregnancy complications, which forwards the lower maternal mortality than women having primary or less education. Besides, children of mothers having secondary education or higher show less stillbirth, lower level of nutritional deficiency, illness and underweight, higher vaccination coverage and high access to child care service than children of mothers with primary education of less educated. Therefore the study has unveils that women necessitate at least secondary level (complete) education for better outcome of maternal and child health. Finally, the study observes the status of maternal health and child health has significantly improved over the last three decades, and the systematic review reveals that female education has played the imperative role for the present advancement of women and child health in Bangladesh.

VII. Conclusion and implication

The systematic review provided facts on the causal effect of woman's education on maternal and child health in Bangladesh. The present review unveiled that the increased female education was significantly enhanced the maternal and child health of Bangladesh since 1990. During pregnancy access to ANC, PNC and SBA services were significantly associated with the educational levels (primary, secondary and higher) of the women. An increased level of women's education led to them in better access to ANC, PNC and SBA services that ultimately contributed to decrease maternal and child mortality and improve overall maternal and child health. Female educational attainment showed a substantial effect in their children's stillbirth, nutritional deficiency, children stunting and wasting, vaccination and children excess to children health care service. Even children of mother with less education were more vulnerable to childhood illness and diarrhoea. However, children of mother with at least, secondary education were more influential to all child health components mentioned above than children of the mother having less education or no schooling. Further, the study showed the level of women education was highly significant, with maternal mortality and child survival. The study observed women having secondary education or higher education have broader opportunity to access to ANC, PNC and SBA and had a more positive experience during delivery than women having primary or less education.

Furthermore, the review results consider educated women easily hold essential and inexpensive available practices to keep up hygiene, are increasingly ready to respond to health indications, having more prospects to update themselves about abortion and additionally prepared to acknowledge treatment where education seems to play an influential role and may believably support to decrease in maternal and child mortality. The current study findings recognise that female education increase their cognitive skills, advance their economic opportunities, support healthier choice during pregnancy and enhance the women for health-seeking behaviour for herself and her children, which re-enforce the better maternal and child health outcomes. Finally, the research findings advocate the policy of implications of 'educating girls-at least secondary level' for enhanced maternal and child health outcomes towards sustainable Bangladesh.

Funding and Conflict of Interest:

The article based on author's MPH research at the University of Glasgow. The MPH programme, including the research for the dissertation, was fully funded by the Prime Minister Fellowship, Government of the People's Republic of Bangladesh. However, the present publication has no funding. The authors declare that there is no conflict of interest for this study.

References:

- [1]. World Health Organization. International statistical classification of diseases and related health problems. World Health Organization; 2016, <https://apps.who.int/iris/handle/10665/246208>, accessed 21 July 2022..
- [2]. Shankar, J., Ip, E., Khalema, E., Couture, J., Tan, S., Zulla, R.T. and Lam, G., Education as a social determinant of health: issues facing indigenous and visible minority students in postsecondary education in western Canada. *International journal of environmental research and public health*, 2013;10(9), pp.3908-3929.
- [3]. Caldwell, J.C."Education as a Factor in Mortality Decline an Examination of Nigerian Data.*Population Studies*, 1979;33(3):395-413.
- [4]. Caldwell, J.C. "Mass Education as a Determinant of the Timing of Fertility Decline." *Population and Development Review* 1980;6(2):225-255.
- [5]. Cochrane, S.H. Fertility and Education: What Do We Really Know? , Vol. 26. 1979 Baltimore, MD; London, England: Johns Hopkins University Press.
- [6]. Joyce, T.J., S. Chou, J. Liu, M. Grossman, and National Bureau of Economic Research. 2007."Parental Education and Child Health:" w13466.
- [7]. Jeffery, R. and A.M. Basu. "Schooling as Contraception?" Pp. 15-47 in *Girls' Schooling, Women's Autonomy and Fertility Change in South Asia*, 1996 edited by R. Jeffery and A.M. Basu. New Delhi, India: Sage Publications
- [8]. Mikkonen, J., & Raphael, D. *Social Determinants of Health: The Canadian Facts*. Toronto, Canada: York University School of Health Policy and Management.2010
- [9]. Gumà J, Solé-Auró A, Arpino B. Examining social determinants of health: the role of education, household arrangements and country groups by gender. *BMC public health*. 2019 Dec 1;19(1):699.
- [10]. Cambois E, Solé-Auró A, Brønnum-Hansen H, Egidi V, Jagger C, Jeune B, Nusselder W, Van Oyen H, White C, Robine JM. Educational differentials in disability vary across and within welfare regimes: a comparison of 26 European countries in 2009. *J E Community Health*. 2016;70:331–8. <https://doi.org/10.1136/jech-2015-205978>
- [11]. Marmot M, Friel S, Bell R, Houweling TA, Taylor S, Commission on Social Determinants of Health. Closing the gap in a generation: health equity through action on the social determinants of health. *Lancet*. 2008;372:1661–9. [https://doi.org/10.1016/S0140-3608\(08\)61690-6](https://doi.org/10.1016/S0140-3608(08)61690-6). Accessed 10 June 2022.
- [12]. Bhalotra S, Clarke D. Educational attainment and maternal mortality: UNESCO, 2013.
- [13]. Pamuk ER, Fuchs R, Lutz W. Comparing relative effects of education and economic resources on infant mortality in developing countries. *Popul Dev Rev*: 2011; 37: 637–664.
- [14]. Mensch, B.S., Chuang, E.K., Melnikas, A.J. and Psaki, S.R., Evidence for causal links between education and maternal and child health: systematic review. *Tropical Medicine & International Health*:2019, 24(5), pp.504-522.

- [15]. WHO . Strategy on women's health and well-being in the WHO European Region,2016. WHO Regional Office for Europe UN City, Marmorvej 51 DK-2100 Copenhagen Ø, Denmark. https://www.euro.who.int/__data/assets/pdf_file/0003/333912/strategy-womens-health-en.pdf?ua=1, Accessed 10 July 2022.
- [16]. WHO, Children reducing mortality, WHO 19 September 2019 <https://www.who.int/news-room/fact-sheets/detail/children-reducing-mortality>, Accessed 12, July 2022.
- [17]. Andriano, L. and Monden, C.W. The causal effect of maternal education on child mortality: Evidence from a quasi-experiment in Malawi and Uganda. *Demography*:2019 56(5), pp.1765-1790.
- [18]. Gakidou, E., Cowling, K., Lozano, R., & Murray, C. J. .Increased educational attainment and its effect on child mortality in 175 countries between 1970 and 2009: A systematic analysis. *Lancet*: 2010, 376, 959–974.
- [19]. Veneman AM. Education is key to reducing child mortality. UN chronicle. 2007 Dec 31;44(4):33-4
- [20]. Falkingham J. Inequality and changes in women's use of maternal Health-care services in Tajikistan. *Studies in family planning*. 2003 Mar;34(1):32-43.
- [21]. Weitzman A. The effects of women's education on maternal health: Evidence from Peru. *Soc Sci Med*. 2017;180:1-9. doi:10.1016/j.socscimed.2017.03.004
- [22]. World Bank, The World Bank in Bangladesh: Overview <https://www.worldbank.org/en/country/bangladesh/overview> , Accessed 07 August 2022.
- [23]. Raynor, J. Educating girls in Bangladesh: watering a neighbour's tree. *Beyond Access*,2005 p.83.
- [24]. World Bank. 2018. Girls Education in Bangladesh: A Promising Journey. https://blogs.worldbank.org/endpovertyinsouthasia/girls-education-bangladesh-promising-journey/?cid=EXT_WBBlogTweetableShare_D_EXT via @WorldBankSAsia. Accessed 10 July 2022.
- [25]. World Bank, The World Bank Data: Bangladesh 2020 <https://data.worldbank.org/country/BD>
- [26]. BBS, Gender Statistics of Bangladesh 2018, Bangladesh Bureau of Statistics (BBS), Statistics and Information Division, Ministry of Planning, Government of the People's Republic of Bangladesh. http://bbs.portal.gov.bd/sites/default/files/files/bbs.portal.gov.bd/page/b343a8b4_956b_45ca_872f_4cf9b2f1a6e0/Gender%20Statistics%20of%20Bangladesh%202018.pdf , Accessed 30 July 2022.
- [27]. UNICEF. 2019. UNICEF Data: Monitoring the situation of Children and Women, Country, Profiles Bangladesh. <https://data.unicef.org/country/bgd/> accessed 07 July 2022.
- [28]. WHO. 2019. Global Health Observatory data repository: Maternal mortality Estimates by country. <http://apps.who.int/gho/data/view.main.1390?lang=en> , Accessed 05 June 2022
- [29]. Moher, David, Alessandro Liberati, Jennifer Tetzlaff, Douglas G. Altman, and PRISMA Group*. "Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement." *Annals of internal medicine* 151, no. 4 (2009): 264-269.
- [30]. Shamseer, L., Moher, D., Clarke, M., Ghersi, D., Liberati, A., Petticrew, M., Shekelle, P. and Stewart, L.A., Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015: elaboration and explanation. *Bmj*: 2015, 349.
- [31]. Brown, C.M., The benefits of searching EMBASE versus MEDLINE for pharmaceutical information. *Online and CD-Rom Review* 1998; 22(1):3–8.
- [32]. Paez A. Grey literature: An important resource in systematic reviews [published online ahead of print, 2017 Dec 21]. *J Evid Based Med*. 2017;10.1111/jebm.12265. doi:10.1111/jebm.12265
- [33]. NIH, Study Quality Assessment Tools, National Heart, Lung and Blood Institute <https://www.nhlbi.nih.gov/health-topics/study-quality-assessment-tools>, Accessed 20 May 2020.
- [34]. Downes MJ, Brennan ML, Williams HC, Dean RS. Development of a critical appraisal tool to assess the quality of cross-sectional studies (AXIS). *BMJ open*. 2016 Dec 1;6(12):e011458.
- [35]. Ioannidis JP, Patsopoulos NA, Rothstein HR. Reasons or excuses for avoiding meta-analysis in forest plots. *BMJ*. 2008 Jun 21;336(7658):1413-5. doi: 10.1136/bmj.a117. PMID: 18566080; PMCID: PMC2432114.
- [36]. United Nations Fund for Population. State of world population 2013. Motherhood in childhood. Facing the challenge of adolescent pregnancy. New York: UNFPA; 2013.
- [37]. Government of Bangladesh. Bangladesh Population Policy-2012. Dhaka: Ministry of Health and Family Welfare; 2012.
- [38]. Abir T, Agho KE, Ogbó FA, Stevens GJ, Page A, Hasnat MA, Dibley MJ, Raynes-Greenow C. Predictors of stillbirths in Bangladesh: evidence from the 2004–2014 nation-wide household surveys. *Global health action*. 2017 Jan 1;10(1):1410048..
- [39]. Ahmed F, Mahmuda I, Sattar A, Akhtaruzzaman M. Anaemia and vitamin A deficiency in poor urban pregnant women of Bangladesh. *Asia Pacific journal of clinical nutrition*: 2003 Dec 1;12(4):460-6.
- [40]. Akter T, Hoque DM, Chowdhury EK, Rahman M, Russell M, Arifeen SE. Is there any association between parental education and child mortality? A study in a rural area of Bangladesh. *Public health*. 2015 Dec 1;129(12):1602-9.
- [41]. Ali NB, Tahsina T, Hoque DM, Hasan MM, Iqbal A, Huda TM, El Arifeen S. Association of food security and other socio-economic factors with dietary diversity and nutritional statuses of children aged 6-59 months in rural Bangladesh. *PloS one*. 2019 Aug 29;14(8):e0221929.
- [42]. Bhowmik J, Biswas RK, Ananna N. Women's education and coverage of skilled birth attendance: An assessment of Sustainable Development Goal 3.1 in the South and Southeast Asian Region. *PloS one*. 2020 Apr 21;15(4):e0231489.
- [43]. Bhowmik J, Biswas RK, Woldegiorgis M. Antenatal care and skilled birth attendance in Bangladesh are influenced by female education and family affordability: BDHS 2014. *Public health*. 2019 May 1;170:113-21.
- [44]. Chakraborty N, Islam MA, Chowdhury RI, Bari W, Akhter HH. Determinants of the use of maternal health services in rural Bangladesh. *Health promotion international*. 2003 Dec 1;18(4):327-37.
- [45]. Chowdhury AH, Hanifi SM, Mia MN, Bhuiya A. Socioeconomic inequalities in under-five mortality in rural Bangladesh: evidence from seven national surveys spreading over 20 years. *International journal for equity in health*. 2017 Dec 1;16(1):197.
- [46]. Chowdhury HA, Ahmed KR, Jebunessa F, Akter J, Hossain S, Shahjahan M. Factors associated with maternal anaemia among pregnant women in Dhaka city. *BMC women's health*. 2015 Dec 1;15(1):77.
- [47]. Chowdhury ME, Botlero R, Saha SK, Dieltiens G, Ronsmans C. Determinants of reduction in maternal mortality in Matlab, Bangladesh: a 30-year cohort study." *Lancet* , 2007; 370(9595): 1320-1328.
- [48]. Chowdhury TR, Chakraborty S, Rakib M, Saltmarsh S, Davis KA. Socio-economic risk factors for early childhood underweight in Bangladesh. *Globalization and health*. 2018 Dec 1;14(1):54.
- [49]. Giashuddin MS, Kabir M, Rahman A, Hannan MA. Exclusive breastfeeding and nutritional status in Bangladesh. *The Indian Journal of Pediatrics*. 2003 Jun 1;70(6):471-5.
- [50]. Hahn Y, Nuzhat K, Yang HS. The effect of female education on marital matches and child health in Bangladesh. *Journal of Population Economics*. 2018 Jul 1;31(3):915-36.

- [51]. Hasan M M, Quazi A, Richardson A. Dynamics in child undernutrition in Bangladesh: Evidence from nationally representative surveys between 1997 and 2014. *Indian journal of public health* : 2018,62(2): 82-88.
- [52]. Hasan MT, Soares Magalhaes RJ, Williams GM, Mamun AA. The role of maternal education in the 15-year trajectory of malnutrition in children under 5 years of age in Bangladesh. *Maternal & child nutrition*. 2016 Oct;12(4):929-39.
- [53]. Hossain, M. B. and Khan. M. H. R.. (2018). "Role of parental education in reduction of prevalence of childhood undernutrition in Bangladesh." *Public Health Nutrition*: 2018; 21(10): 1845-1854.
- [54]. Huq, M. N. and T. Tasnim "Maternal education and child healthcare in Bangladesh." *Maternal & Child Health Journal*: 2008;12(1): 43-51.
- [55]. Kamal, S. M. "What is the association between maternal age and neonatal mortality? An analysis of the 2007 Bangladesh Demographic and Health Survey." *Asia-Pacific Journal of Public Health* :2015, 27(2): NP1106-1117.
- [56]. Kamal SM, Ashrafuzzaman M, Nasreen SA. Risk factors of neonatal mortality in Bangladesh. *Journal of Nepal Paediatric Society*. 2012 Feb 28;32(1):37-46.
- [57]. Mistry SK, Hossain MB, Khanam F, Akter F, Parvez M, Yunus FM, Afsana K, Rahman M. Individual-, maternal-and household-level factors associated with stunting among children aged 0–23 months in Bangladesh. *Public health nutrition*. 2019 Jan;22(1):85-94.
- [58]. Nahar S, Rahman A, Nasreen HE. Factors Influencing Stillbirth in Bangladesh: A Case–Control Study. *Paediatric and perinatal epidemiology*. 2013 Mar;27(2):158-64.
- [59]. Puglisi C, Busetta A. The Effect of Education on Under-Five Mortality: Individual and Community-Level Effects in Bangladesh. *Statistica*. 2019 Aug 6;79(2):181-200.
- [60]. Rahman MS, Mushfiqee M, Masud MS, Howlader T. Association between malnutrition and anemia in under-five children and women of reproductive age: Evidence from Bangladesh Demographic and Health Survey 2011. *PloS one*. 2019 Jul 3;14(7):e0219170.
- [61]. Semba RD, de Pee S, Sun K, Sari M, Akhter N, Bloem MW. Effect of parental formal education on risk of child stunting in Indonesia and Bangladesh: a cross-sectional study. *The lancet*. 2008 Jan 26;371(9609):322-8.
- [62]. Yaya S, Bishwajit G, Ekholuenetale M. Factors associated with the utilization of institutional delivery services in Bangladesh. *PloS one*. 2017 Feb 13;12(2):e0171573.
- [63]. Agarwal KN, Agarwal DK, Sharma A, Sharma K, Prasad K, Kalita MC, Khetarpaul N, Kapoor AC, Vijayalekshmi L, Govilla AK, Panda SM. Prevalence of anaemia in pregnant & lactating women in India. *Indian journal of medical research*. 2006 Aug 1;124(2):173.
- [64]. Al-Mehaisen L, Khader Y, Al-Kuran O, Abu Issa F, Amarin Z. Maternal anemia in rural Jordan: room for improvement. *Anemia*. 2011 Jan 1;2011.
- [65]. Ny P, Dejin-Karlsson E, Udén G, Greiner T. Health education to prevent anemia among women of reproductive age in southern India. *Health care for women international*. 2006 Feb 1;27(2):131-44.
- [66]. UNICEF, Maternal and Newborn Health Disparities in Bangladesh, https://data.unicef.org/wp-content/uploads/country_profiles/Bangladesh/country%20profile_BGD.pdf, Accessed 20 July, 2022.
- [67]. Feyissa TR, Genemo GA. Determinants of institutional delivery among childbearing age women in Western Ethiopia, 2013: unmatched case control study. *PloS one*. 2014 May 8;9(5):e97194.
- [68]. Kesterton AJ, Cleland J, Sloggett A, Ronsmans C. Institutional delivery in rural India: the relative importance of accessibility and economic status. *BMC pregnancy and childbirth*. 2010 Dec 1;10(1):30.
- [69]. Dahiru T, Oche OM. Determinants of antenatal care, institutional delivery and postnatal care services utilization in Nigeria. *Pan African medical journal*. 2015;22(1).
- [70]. Bhuiya A, Aziz A, Chowdhury M. Ordeal of women for induced abortion in a rural area of Bangladesh. *J Health Popul Nutr* 2001; 19: 281–90.
- [71]. Kapil Ahmed M, van Ginneken J, Razzaque A. Factors associated with adolescent abortion in a rural area of Bangladesh. *Trop Med Int Health* 2005; 10: 198–205. 26
- [72]. Onah HE, Ikeako LC, Iloabachie GC. Factors associated with the use of maternity services in Enugu, southeastern Nigeria. *Soc Sci Med*. 2006 Oct; 63(7):1870-78.
- [73]. Raghupathy S. Education and the use of maternal health care in Thailand. *Social science & medicine*. 1996 Aug 1;43(4):459-71.
- [74]. Kim S, Kim SY. Exploring factors associated with maternal health care utilization in Chad. *J Glob Health Sci*. 2019 Jun;1(1):e31. <https://doi.org/10.35500/jghs.2019.1.e31>.