



THESIS TITLE

THE ROLE OF PARENTAL COMMUNICATION, GENDER NORMS, AND ADOLESCENT
MENSTRUAL HEALTH IN BANGLADESH: A SECONDARY LONGITUDINAL ANALYSIS

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Declaration

I, Sadia Aktar Silvia, hereby declare that this thesis entitled "**The role of parental communication, gender norms, and adolescent menstrual health in Bangladesh: A secondary longitudinal analysis**" is an original work submitted in partial fulfilment of the requirements for the degree of Master of Public Health (MPH) at the James P. Grant School of Public Health (JPGSPH), BRAC University, Dhaka, Bangladesh.

I further declare that this work has not been submitted previously, in whole or in part, for any other degree or examination at this or any other university or institution.

All sources used in this thesis have been duly acknowledged and cited. Any assistance received has been mentioned in the acknowledgements section.

I have also added a separate declaration on GenAI use at the end of this work.

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Ethics Statement

Ethical approval for this study was obtained from the Institutional Review Board (IRB) of BRAC James P Grant School of Public Health at BRAC University (Reference number: MPH-2025-008). Additionally, ethical approval for the parent longitudinal study was granted by both Alfred Hospital Ethics Committee (369/22) and the BRAC JPGSPH at BRAC University. Written informed consent was obtained from all participants before initiation of the data collection. As this study involved human participants, it followed the standard ethical procedure of the Institutional Review Board and the 1975 Declaration of Helsinki.

Abstract

Background:

Adolescent girls are a vulnerable group in terms of menstrual and reproductive health information and management. Around the world, many adolescent girls face social norms or stigma, taboo, gender norms, limited access to menstrual health information and negative attitudes from their family as well as the community. It directly affects their menstrual health and overall reproductive health, which shows a public health concern. Many research studies suggested that adolescent girls pursue their menstrual health-related education and training from their parents. Depending on their (guardians') knowledge, attitudes, and norms regarding menstruation, adolescent girls' perspectives can vary. As a result, this study aims to examine the changes in gender and social norms, menstrual knowledge and attitudes among guardians over time and how it changes the perception of their adolescent girls.

Objectives:

The main objective of this study was to examine the changes in parental gender social norms, knowledge and attitudes about menstrual & reproductive health from 2023 to 2025 and how these changes affected girls' perceptions. The specific objectives were: 1) to assess the changes in the outcomes over the years, 2) to assess the association between the outcomes and the socio-demographic status of guardians, 3) to determine the changes in their adolescent girls' perspectives and to see whether parental communication mediates the relationship between guardians' menstrual knowledge and girls menstrual health literacy.

Methods:

The study was conducted using secondary analysis of the Adolescent Menstrual Experiences and Health Cohort (AMEHC) study, a longitudinal research project currently being carried out in the sub-division of Khulna, Bangladesh. The AMEHC began with 2015 adolescent girls and their guardians in 2023 and continued till now (2026). This study focused on the baseline (2023) and wave 2 (2025) datasets of both guardians and girls. A longitudinal analysis was done using GSEM to examine how parental views on menstrual knowledge influence adolescent girls' perspectives. Additionally, a mediation analysis involving 1000 times bootstrapping iterations was performed to explore the pathways through which menstrual health information is transmitted from guardians to girls.

Results:

The mean age of the adolescent girls was 11.95 years (± 0.0206) at baseline. The result showed positive changes over time with progressive gender norms perception, reduced negative menstrual attitudes among guardians, but over the years, menstrual knowledge shifted into a lower category and social restriction increased among guardians (from baseline to wave 2). There was a significant association observed between the socio-demographic status of guardians and reducing gender ($p < 0.05$) and social norms restrictions ($p < 0.05$), improving a high level of menstrual knowledge ($p < 0.05$) and increasing positive attitudes ($p < 0.05$) on menstruation, except for religion. The longitudinal analysis revealed that gender norms ($\beta = -0.45$, $SE = 0.03$, $p < 0.05$) reduced in wave 2 by 0.45 times from baseline, menstrual knowledge ($\beta = 1.86$, $SE = 0.07$, $p < 0.05$) increased by 1.86 times and social norms (restrictive) increased by 9.48 times from 2023 to 2025 among adolescent girls. The results also showed significant changes in guardians' perceptions regarding gender norms ($\beta = 0.10$, $SE = 0.02$, $p < 0.05$), menstrual knowledge ($\beta = 0.13$, $SE = 0.06$, $p < 0.05$) and social norms ($OR = 1.37$, $p < 0.05$) in relation to their girls. Moreover, mediation analysis showed that parental communication did not function as a potential mediator ($\beta = 0.11$, $SE = 0.08$, $p = 0.172$), but also guardians' menstrual knowledge did not associate with girls' menstrual health literacy ($OR = 1.11$, $p = 0.106$).

Conclusions:

Guardians are key individuals for the majority of adolescents to whom they can talk about their menstruation and reproductive health. And if mother-daughter communication is strong, it can impact on gaining better menstrual knowledge, attitudes and menstrual health management (MHM). When they can talk freely, this helps to reduce the gender norms restrictions and increase social acceptance by reducing stigma related to menstruation management. Policy makers and programme implementers should design programmes that emphasise parental involvement, address the root causes of stigma and promote an equitable society.

Keywords:

Social and gender norms, girls' menstrual health literacy, restrictions, progressive views, socio-demographic status, mediation analysis, Bangladesh

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Table of Contents

Declaration.....	2
Approval	3
Ethics Statement.....	4
Abstract.....	5
Acknowledgements.....	7
List of Tables	10
List of Figures	10
List of Acronyms	11
Chapter 1: Introduction	12
1.1 Background and Rationale.....	12
1.2 Problem Statement.....	14
1.3 Research Questions.....	15
1.4 Study Objectives	15
1.4.1 Overall Objective	15
1.4.2 Specific Objectives	15
1.5 Structure of the Thesis	16
Chapter 2: Literature Review.....	16
2.1 Global Evidence.....	16
2.2 About the Parent Study	19
2.3 Conceptual/Theoretical Framework.....	21
Chapter 3: Methods.....	22
3.1 Study Design.....	22
3.2 Study Area and Setting	22
3.3 Study Period.....	22
3.4 Study Population.....	22
3.4.1 Study Population.....	22
3.4.2 Inclusion and Exclusion Criteria.....	23
3.5 Sample Size.....	23
3.6 Sampling Technique	23
3.7 Variables	24
3.7.1 Dependent Variable(s)	24
3.7.2 Independent Variables	26
3.7.3 Operational Definitions.....	27

3.8 Data Collection	32
3.8.1 Data Collection Tools	32
3.8.2 Pretesting.....	33
3.8.3 Data Collection Procedure	33
3.9 Data Management and Quality Assurance.....	33
3.10 Data Analysis.....	34
3.11 Ethical Considerations	36
Chapter 4: Results	36
Table 1: Adolescent Girls’ Characteristics during baseline.....	37
Table 2: Changes in guardians’ gender and social norms, menstrual knowledge and attitudes between baseline and wave 2.....	42
Table 3: Association between guardians’ gender and social norms, menstrual knowledge and attitude with sociodemographic information at baseline	44
Table 4.1: Changes in girls’ gender and social norms, and menstrual knowledge between baseline and wave 2	46
Table 4.2: Parental views associated with adolescent girls’ endorsement of gender norms, social norms, and menstrual knowledge	48
Table 5.1: Association between girls’ menstrual health literacy and guardian menstrual knowledge	50
Table 5.2: Mediation analysis with guardian menstrual knowledge and girls’ menstrual health literacy (parental communication as a mediator).....	52
Chapter 5: Discussion	52
Chapter 6: Conclusion and Recommendations	57
6.1 Conclusion	57
6.2 Recommendations.....	57
Declaration of GenAI Use	59
References.....	60
Appendices.....	69
Appendix A: Data Collection (variable metrics)	69

List of Tables

Table 1: Adolescent Girls' Characteristics during baseline.....	37
Table 2: Changes in guardians' gender and social norms, menstrual knowledge and attitudes between baseline and wave 2.....	42
Table 3: Association between guardians' gender and social norms, menstrual knowledge and attitude with sociodemographic information at baseline	44
Table 4.1: Changes in girls' gender and social norms, and menstrual knowledge between baseline and wave 2	46
Table 4.2: Parental views associated with adolescent girls' endorsement of gender norms, social norms, and menstrual knowledge	48
Table 5.1: Association between girls' menstrual health literacy and guardian menstrual knowledge	50
Table 5.2: Mediation analysis with guardian menstrual knowledge and girls' menstrual health literacy (parental communication as a mediator).....	52

List of Figures

Figure 1: Conceptual framework	21
Figure 2: Explanation of mediation analysis	27
Figure 3: Histogram for social norms residuals.....	35
Figure 4: Percentage of parental communication comfort among girls.....	40
Figure 5: Percentage of girls menstrual health literacy score	40
Figure 6: Mediation analysis pathways.....	51

List of Acronyms

Acronyms	Full Form
AMEHC	Adolescent Menstrual Experiences and Health Cohort
Co-ed	Co-educational Institutions
FGD	Focus Group Discussion
GSEM	Generalized Structured Equation Model
IDI	In-Depth Interview
KCC	Khulna City Corporation
KII	Key Informant Interview
LMIC	Lower Middle-Income Country
MH	Menstrual Health
MHL	Menstrual Health Literacy
MHM	Menstrual Health Management
SDG	Sustainable Development Goals
UNICEF	United Nations International Children's Emergency Fund
UTI	Urinary Tract Infection
WASH	Water Sanitation and Hygiene
WHO	World Health Organization

Chapter 1: Introduction

1.1 Background and Rationale

Globally, there are many taboos and norms related to menstruation and menstrual health practices, which affect menstrual health outcomes of individuals, particularly adolescent girls. These norms vary depending on societal and community contexts, as well as mother-daughter communication. “Menstrual health (MH) is a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity, in relation to the menstrual cycle (Hennegan et al., 2021)”. Menstrual health is an integral part of sexual and reproductive health, and directly linked to the health and well-being of those who menstruate (Babbar et al., 2022). Additionally, menstrual health is a multidimensional concept which not only focuses on hygiene management of menstruation, but also it emphasises the menstrual cycle, recognition of symptoms, access to appropriate health services and materials, and social conditions which can shape menstruation experiences. These elements can influence short-term and long-term health outcomes (WHO/UNICEF, 2019).

Adolescent girls and women often face negative experiences related to menstruation, particularly in low and middle-income countries, due to gender inequality and limited access to health care and knowledge, which affects their menstrual hygiene management (MHM) (Hennegan et al., 2019). Negative experiences with menstrual health often led to several health issues (reproductive and urinary infections), including poor mental health (Regional Health–Americas, 2022). Based on social, religious, and cultural restrictions, MHM varies among adolescent girls & women, which can lead to either effective or ineffective menstrual practice management and menstrual health (MH) (Kaur & Byard, 2021).

In many societies, social norms and taboos associated with menstruation limit the comfort of communication between guardians and adolescent girls. Specifically, in Bangladesh, studies found that mothers are the key source of information for adolescent girls regarding menstruation, but often they delay the initiation of conversation about menstruation until their daughters reach menarche (Zakaria et al., 2019). In some situations, mothers start the conversation, but it goes one-sided with the mothers only, where the girls are the listeners. If they ask questions or participate actively, it is

considered disrespectful, or girls are suspected of being engaged in sexual activities (Zakaria et al., 2019; Weng et al., 2026). These practices remain consistent from year to year and continue to exist in many societies and countries. Therefore, it is essential to understand all aspects of menstrual health, like social norms, gender norms and adequate communication between guardians and adolescent girls. This is vital for ensuring better menstrual and reproductive health services and outcomes for all adolescent girls.

Study Justification

Globally, millions of adolescent girl's experience menstruation; many of them face a lot of difficulties and challenges managing it properly, which negatively affects their health and well-being. Among all the challenges, the most pressing ones are access to resources, healthcare facilities, and knowledge and support during menstruation. A systematic review by Chandra-Mouli and Patel found that mothers are the primary source of information for adolescent girls about menstrual knowledge and menarche, followed by some supporting roles such as sisters and peers (Chandra-Mouli & Patel, 2017). Although mothers become the main source of information, little scientific evidence exists for many communities regarding how much knowledge they have, how much they are delivering to their daughters, and how the adolescent girls are perceiving those into their attitude & practice of menstruation. Therefore, this study aims to investigate the importance of parent-adolescent communication, which health professionals and guardians can utilize to establish an effective communication system with their adolescent girls to improve their menstrual health outcomes. In particular, the finding will help policymakers and other stakeholders to provide need-based support and specific implementation to ensure better adolescent health, which will help to fulfil SDG-3 (Good health and well-being).

The present study focuses on how parental knowledge and attitudes influence adolescent girls' attitudes and practices of menstrual health. This study used unique guardian-daughter dyad data from the parent AMEHC study to achieve this aim. Furthermore, as the AMEHC is a longitudinal cohort study, this allows us to examine the changes in guardians' and adolescent girls' views on gender norms and menstrual health-related knowledge and attitudes over the years. Thus, the AMEHC dataset was an ideal source for conducting the current study, as it had all the data from one source.

1.2 Problem Statement

Although menstruation is a natural process for all women or menstruating individuals, many adolescent girls need to go through a lot of stigma, social norms, insufficient knowledge, and improper menstrual practices. This situation is being observed in many South Asian countries, and Bangladesh is no exception in this regard. Many people living in Bangladesh have misconceptions and misinformation about menstruation, which is considered a taboo topic, and it directly impacts girls' confidence, menstrual management, and daily activities.

Parents, specifically mothers, are the key players who influence adolescent girls' menstrual knowledge, attitude, and practices through their effective communications. But, few mothers in Bangladesh openly discuss menstruation with their daughters. This has an impact on adolescents' accurate information about menstruation and their supportive care. In the long-term effect, it impacted adolescent girls' health and well-being.

Further, parental knowledge changes over time, and how this change influences the knowledge and perspectives of adolescent girls about menstruation remains to be explored, particularly in the context of Bangladesh. In Bangladesh, many mothers are shifting their menstrual practice from traditional methods to modern methods; however, there are still many areas where traditional methods are used more. This practice fully depends on parental menstrual knowledge and this depends on many factors such as socio-economic status, education, society and their own experiences. As mothers are the primary source of information for adolescent girls regarding menstruation, it is necessary to explore how this knowledge is transforming.

As a result, this study focused on highlighting the gaps by following a longitudinal secondary data analysis to examine how the parental knowledge about menstruation changes over the years and how their communication helps adolescent girls to deal with the concept of gender and social norms, menstrual knowledge and health literacy to tackle menstrual management.

1.3 Research Questions

1. Do the parents of adolescent girl's report changing gender norms, knowledge about reproductive or menstrual health, and attitudes towards menstruation over a two-year period?
2. Do parental gender norms, knowledge, and attitudes on menstruation vary according to sociodemographic predictors (baseline)?
3. Are changing parental views associated with changes in adolescent girls' endorsement of gender norms, social norms and knowledge related to menstrual health?
4. Does parental comfort discussing menstruation mediate the relationship between guardian menstrual knowledge and girl's menstrual health literacy, care-seeking attitudes regarding menstruation?

1.4 Study Objectives

1.4.1 Overall Objective

To examine the change of parental gender and social norms, knowledge and attitudes about menstrual & reproductive health from 2023 to 2025, and to assess the association between their adolescent girls' parental support and adolescent girls' knowledge & practice, and comfort attitudes regarding menstruation.

1.4.2 Specific Objectives

The specific objectives of this study are:

1. To assess the change of parental gender and social norms, knowledge, and attitudes about menstrual & reproductive health, between the baseline and wave 2 data.
2. To examine the variation of parental gender and social norms, knowledge, and attitudes about menstrual & reproductive health according to the sociodemographic status (baseline).
3. To determine the changes of parental views associated with adolescent girls' endorsement of gender norms, social norms, menstrual knowledge and attitude towards menstrual health.
4. To examine whether the parental communication comfort mediates the relationship between guardian menstrual knowledge and girls' menstrual health literacy.

1.5 Structure of the Thesis

This thesis is organized into six chapters. Chapter 1 provides the introduction, background, and study objectives. Chapter 2 presents a comprehensive review of existing literature (global evidence, about the parent study). Chapter 3 outlines the methodology used in this study. Chapter 4 presents the findings. Chapter 5 provides a discussion and interpretation of the results in light of existing evidence. Chapter 6 concludes the thesis with key conclusions, recommendations, and limitations.

Chapter 2: Literature Review

2.1 Global Evidence

According to UNICEF, 1.8 billion people menstruate every month worldwide, and adolescent girls are a particularly vulnerable group because of menstrual knowledge and practice, societal taboos, and gender inequality (n.d.). Globally, people consider menstruation a shame and an unrevealed fact that can't be shared openly with anyone (World Health Organization, 2024). Later, this stigma creates information gaps among menstruating people, and mostly, they become unprepared or receive insufficient information about their first period (World Health Organization, 2024). Another piece of evidence is that when menstruating women or people have inadequate information, it leads to unhealthy and unhygienic menstrual practice and management, and misconceptions among people around more or less every part of the world (World Bank, n.d.).

In lower-middle-income countries, adolescent girls and women face menstrual stigma and taboos among their societies, access to very limited information about the menstrual cycle, pain, and menstrual management before their menarche phase, and this stigma can lead to health complications in their adulthood (Hennegan, Tsui, et al., 2019). This stigma and misinformation about menstruation occur because of the lack of proper communication and comfort. In many cases, it is found that the menstrual health-related information is given by the mother, friends, or any female member to their adolescent girls. When mothers or the female members share information with their limited knowledge, it leads to inadequate perceptions about gender norms and menstrual health knowledge, towards the adolescent girls (Plesons et al., 2021).

In many societies, menstruation remains associated with cultural myths and social taboos, which negatively influence how it is seen, discussed, or managed. These cultural stigmas and social norms

create social inequalities and negatively impact MHM, leading to poor health and compromised well-being of individuals who menstruate (World Bank, n.d.). In some communities, people use coded language to refer to their period. They often use “p’s”, “that time”, “in red”, “being up” (“oli waggulu”/“munnage ndi waggulu”), or “my days” (“ennaku zange”), so that outsiders do not understand what they are referring to (Hennegan et al., 2020). Also, social taboos and myths regarding menstruation create a barrier for adolescent girls to get proper or accurate information about menstrual health from others, including health professionals, particularly in low and middle-income countries (S. Mohammed & Larsen-Reindorf, 2020; Chandra-Mouli & Patel, 2020). Multiple taboos exist among South Asian countries, shaped by their culture, religion, and society (Paul, 2019). Some common taboos include restrictions on taking a bath during menstruation, touching a cow, performing cooking activities, and attending religious activities (Castro & Czura, 2025; S. Mohammed & Larsen-Reindorf, 2020). In particular, many communities believe menstruation is a silent subject that is not allowed to be discussed openly with anyone; it needs to be hidden, and this is how the process remains stigmatized (Gbogbo et al., 2025). In many countries, intense stigma exists, for instance, in some parts of India, girls experience restriction to go to school & wear a new dress during their menstruation (Kumar & Srivastava, 2011). In Ethiopia, some believe that if girls take a bath during their menstruation, they will get heavy bleeding, which is harmful (Phillips et al., 2014). In Ghana, Ethiopia, Cambodia, and Tanzania, there is a belief that disposing of menstrual materials improperly can negatively affect fertility and bring bad luck (Sommer et al., 2015; Kpodo et al., 2022). In Nepal, girls are sent to Chhaupadi, a practice that deems them impure or unclean during their menstruation, which forces them to stay away from their homes and restricts them from performing in any religious activities. However, this traditional practice was outlawed in 2005 (Thakuri et al., 2021). Additionally, in Bangladesh, cultural norms discourage girls from sharing or discussing menstruation openly, perpetuating harmful menstrual practices (Hennegan & Sol, 2020). As a result, many adolescent girls feel hesitant to share concerns about issues related to menstruation with others.

In most situations, adolescent girls do not know what menstruation is, or they hold misinformation when they experience it for the first time (Chandra-Mouli & Patel, 2017). A study conducted in China among 1573 girls found that the majority of the girls surveyed had insufficient knowledge or misconceptions about menstruation (Tang et al., 2003). Another study from rural Nepal reported that

only 6.0% of 150 girls surveyed know that menstruation is a physiological process; on the other hand, 82.0% believe menstruation is a curse (Adhikari et al., 2007). And the same thought is found in India & Uganda (Thakre et al., 2011; Boosey et al., 2014). Moreover, many people from different countries, like 19.3% from Pakistan, 18.3–86.3% from India (five states), and 96.7% from Nigeria, believed that menstruation is a bodily function or process for every female (Chandra-Mouli & Patel, 2017). And this is a natural process for all women and girls. Additionally, 75% girls reported receiving some information regarding menstruation before reaching that phase in Rajshahi, Bangladesh (Ha & Alam, 2022). Still, many adolescent girls across Bangladesh lack proper knowledge or information about menstruation. Limited knowledge about menstruation can lead to low confidence level and self-esteem, academic failure, poor menstrual management, which can result in infection or gynecological disorders and reproductive tract infections among girls (Siddique et al., 2023). Depending on cultural and family restrictions, most often adolescent girls restrict their involvement in daily activities, participation in different events, and keep themselves isolated (Mohammed & Larsen-Reindorf, 2020).

In many contexts, guardians play a significant role in shaping the knowledge and attitudes of their adolescent girls regarding delicate matters like reproductive health and menstrual health. Most of the time, adolescent girls receive reproductive and menstrual health information from their mothers, and it directly affects their menstrual health management and practices (Sooki et al., 2016). Some research studies suggest that communication between parents and adolescent girls about menstruation can enhance the girls' capacity to adapt with better menstrual hygiene management and practices, while also reducing their fear regarding menstruation (Olika et al., 2025). One study from Bangladesh showed that when mothers or guardians are supportive and educated, they try to help their daughters in maintaining menstrual hygiene and adopting positive attitudes towards it (Hasan et al., 2021). Furthermore, when mothers and fathers are educated, their daughters are less likely to miss school during menstruation (Hasan et al., 2021). Adequate information leads to good menstrual management, and it brings improved health outcomes and reduces the chances of many infections (UTI) among girls (Appiah-Agyekum et al., 2025). However, many mothers still perceive menstruation as a shameful and taboo topic, which restricts open discussion with their daughters (Olika et al., 2025). When adolescent girls do not share menstruation-related issues with their mothers, most often that results in poor health outcomes for the girls (Rana & Jami, 2018). Despite

the critical role of communication, there remains a gap in research that specifically focuses on the role of parents in shaping their adolescent girls' knowledge and attitudes towards menstruation.

2.2 About the Parent Study

BRAC James P Grant School of Public Health (JPGSPH), in collaboration with the Burnet Institute, Australia; the University of Queensland, Australia; WaterAid Bangladesh; and Nabolok Parishad, initiated the Adolescent Menstrual Experiences and Health Cohort (AMEHC) study in 2023. It is an ongoing prospective longitudinal study conducted in Khulna, Bangladesh. Khulna District has nine sub-districts and five metropolitan thanas; the AMEHC study is collecting data from one urban thana (Khulna City Corporation) and one rural thana, Dumuria. A total of 101 schools agreed to participate in the study. The total sample size for the adolescent girls was 2015 among the selected schools. And specifically, the girls were recruited from class 6 (in 2023), and their mean age was 12 years old during baseline.

The AMEHC collects data through the girls' survey, the guardian survey, and the school checklist.

1. Girls' survey:

The girls' data is collected in four different waves, which are baseline (2023), wave 1 (2024), wave 2 (2025), and wave 3 (2026). The adolescent girls survey, it collects girls' information regarding menstrual health, knowledge, attitudes, practices, and physical & mental health during menstruation.

2. Guardian Survey:

The guardian survey was conducted in two different waves: the first baseline in 2023 and wave 2 in 2025. During the guardian surveys, the researchers collected their beliefs, gender norms, and menstrual health-related knowledge, attitudes, and practice-related information.

3. School Checklist:

As this study focuses on adolescent girls who mostly spend time in school. So, for that, it collects girls' attendance, performance-related information, and water, sanitation, and hygiene (WASH)-related information from the school checklists. And it was collected annually from 2023 to 2026.

Moreover, the ethical approval was obtained both from Alfred Hospital Ethics Committee (369/22) and the BRAC JPGSPH at BRAC University for the AMEHC study. Also, informed consent and assent (for adolescent girls) were obtained from all participants and provided information sheets before the initial data collection. As this involved human participants, it followed the standard ethical procedure of the 1975 Declaration of Helsinki and Institutional Review Board.

2.3 Conceptual/Theoretical Framework

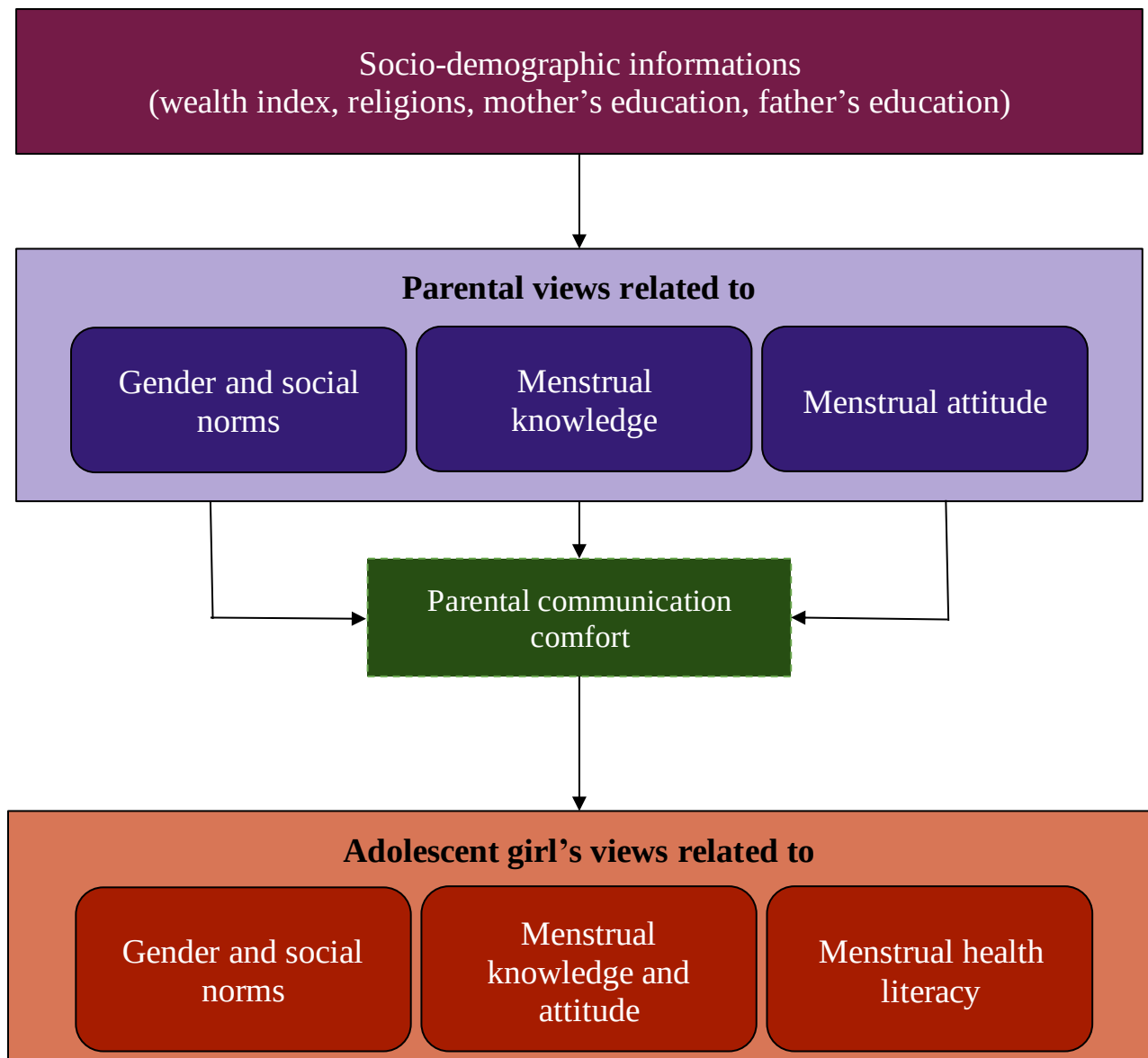


Figure 1: Conceptual framework

Chapter 3: Methods

3.1 Study Design

This study was a secondary analysis of the datasets from the longitudinal AMEHC study. It focused on only quantitative analysis of the baseline and wave 2 data collected from adolescent girls and their parents, in 2023 and 2025 respectively, informed by the research objectives mentioned earlier. It allowed this study to examine the changes of parental views associated with adolescent girls' endorsement of gender norms, social norms, menstrual knowledge and attitude towards menstrual health and whether parental communication comfort mediates the relationship between guardian menstrual knowledge and girls' menstrual health literacy.

3.2 Study Area and Setting

The study took place in Khulna District, Bangladesh. The reason for choosing Khulna was based on the feasibility of the longitudinal study, the absence of overlapping menstrual health interventions at the time of data collection, upheaval of WASH facilities, a stronger local partnership, and climate vulnerabilities in that area. Khulna has nine upazilas and five metropolitan thanas (Hennegan et al., 2024). Specifically, it focused on one urban thana (Khulna City Corporation) and one rural thana, Dumuria, for the data collection. Moreover, from those selected areas, it focused on the 101 schools randomly.

The present study also adopted the same settings as the primary study.

3.3 Study Period

The primary study was conducted from 2022 to 2026. The present study analyzed data obtained from 2023 (baseline) and 2025 (wave 2).

3.4 Study Population

3.4.1 Study Population

The present study population was secondary-school-going adolescent girls (aged 12 years) and their parents from 101 selected schools in the AMEHC study from Khulna, Bangladesh. The specific groups involved in this study were:

- **Adolescent girls:** The adolescent girls who enrolled in class 6 in 2023 and their mean age was 12 years.
- **Guardians:** For guardians, mostly mothers, fathers, elder brothers, or sisters, were part of the survey. And the majority of the respondents were mothers.

3.4.2 Inclusion and Exclusion Criteria

Inclusion criteria:

- Mothers and adolescents who participated in the baseline survey.
- Households or mothers who were followed up in year 2 (wave 2).

Exclusion criteria:

- Parents (Mothers) and adolescents whose data were not available for baseline and Wave 2.
- Any other guardian responses rather than mothers.

3.5 Sample Size

In the AMEHC study, the survey started with 2015 adolescent girls in the baseline and followed them in different waves. This study adapted the whole sample of 2015 adolescent girls and their guardians' data.

3.6 Sampling Technique

The primary study used a proportional stratified random sampling method for selecting the adolescent girls from 101 schools. This sampling approach was used to ensure the accuracy of samples with the diversity of the schools from the study areas. The primary sampling frame was formed with a comprehensive listing from co-educational institutions, madrasa and single-sex schools by NGO partner WaterAid in 2022. This included all the adolescent girls' school enrolment information from the selected schools. Schools were the primary sampling unit (PSU) and each school was defined as a stratum. A computer-generated number was obtained for selecting the schools and a cluster sampling method was used at the classroom level for selecting the participants fairly.

The school and adolescent girls' selection process:

1. **Sampling frame:** The first entry point for sampling was a comprehensive school listing of all educational institutions located in the Khulna City Corporation (KCC) and Dumuria subdistrict. This included co-educational institutions, single-sex schools and madrasas.
2. **Stratification:** All the schools were categorised into different strata based on their types (co-ed, single sex and madrasa) and their geographical locations (KCC and Dumuria).
3. **Proportional allocation:** The team members calculated the total number of girls enrolled in each school. The selected school for each category was determined by the proportion of girls enrolled in the specific category relative to the total number of girls.
4. **Random selection:** After completing the proportions, individuals from each stratum were selected by following random selection to reduce the selection biases.

3.7 Variables

3.7.1 Dependent Variable(s)

The dependent variables were:

1. **Guardian gender norms score:**

One of the outcome variables is guardian gender norms. This data was collected in baseline and wave 2. This variable was created by using the individual questions from the “Guardian survey of AMEHC study”. The variable was divided into four different categories 0-1 endorsed, 2 endorsed, 3 endorsed and 4-5 endorsed, which represented low restrictive (progressive), restrictive (2 and 3 endorsed) and high restrictive sequentially.

2. **Guardian menstrual knowledge score:**

In the Guardian survey of wave 2, some questions captured information related to the guardians' menstrual knowledge, attitude, and norms. Those variables were used to make a knowledge score for the guardians. This variable was divided into 3 categories to make easy interpretation, which were low, moderate and high. The higher the score high knowledge and the lower the score low knowledge.

3. Guardian menstrual attitude:

Another outcome variable considered for the analysis was the guardian's menstrual attitude. This variable showed how the guardians or family members think about menstruation (wave 2). This variable was created from the specific question regarding shame. It was divided into two categories, which were low and high attitudes towards menstruation. If they agree with a shameful menstruation statement referred to as a high attitude (negative) and disagree with low attitude (positive).

4. Guardian social norms score:

One of the important outcome variables considered for analysis was social norms. Girls face many social restrictions from family and society, so this variable showed how social norms shape their daily activities related to menstruation. This variable was divided into three different categories, which were low, moderate, and high social norms. The higher the score high norms and the lower the score low norms.

5. Girls' gender norms score:

One of the outcome variables was girls' gender norms, whose data were collected in wave 2. These variable captured girls' perspectives related to gender norms. The total score was divided into three different categories 0-1 endorsed, 2 endorsed, and 3 endorsed, which represented as low restrictive, restrictive and high restrictive sequentially.

6. Girls' social norms:

Girls' social norms were an important outcome that assessed how girls perceived societal norms regarding their menstruation (wave 2). This variable was divided into three categories, which were low, moderate and high social norms. The low social norms are referred to as progressive attitudes and the high social norms are referred to as restrictive attitudes.

7. Girls' menstrual knowledge and attitude score:

Another important outcome considered for analysis was girls' menstrual knowledge and their perceptions related to menstruation. All the variables that referred to menstrual knowledge were combined to construct a composite measure aligned with the available study variables.

Later, the composite score was divided into three categories, which were low, moderate, and high levels of menstruation knowledge among adolescent girls. Here, a higher score referred to higher menstrual knowledge and a lower score referred to lower menstrual knowledge.

8. Girls' menstrual health literacy score (MHL):

This outcome variable represented girls' menstrual health literacy. This variable contains 6 individual questions related to menstrual health support and the availability of resources. It created a combined total score with those variables. The score was divided into two categories, which were less than 3 or equal (low MHL) and more than 3 (high MHL).

3.7.2 Independent Variables

The independent variables were:

Wealth index:

Depending on the household characteristics and asset ownership, it was divided into five categories following the standard of the District Health Information Software System (DHIS), which were poorest, poor, medium, wealthy and wealthiest.

Religion:

Religion was considered an important factor influencing the outcomes. The study sample included adolescent girls and their parents who followed different religions. As the Christians and others were very few in numbers, it was re-categorised with Hindus/others to get a representation of data. As a result, this religious group belongs to two categories, which are Muslim and Hindu/others.

Fathers and mothers' education:

The education of father and mother was also considered an important independent variable, which affected the different outcome variables considered for the analysis.

Parental communication comfort:

In the girls' survey (wave 2), there was a specific question that explored communication comfort about menstruation with parents. This variable was used as a potential mediator between the dependent and the independent variables, as shown in Figure 2.

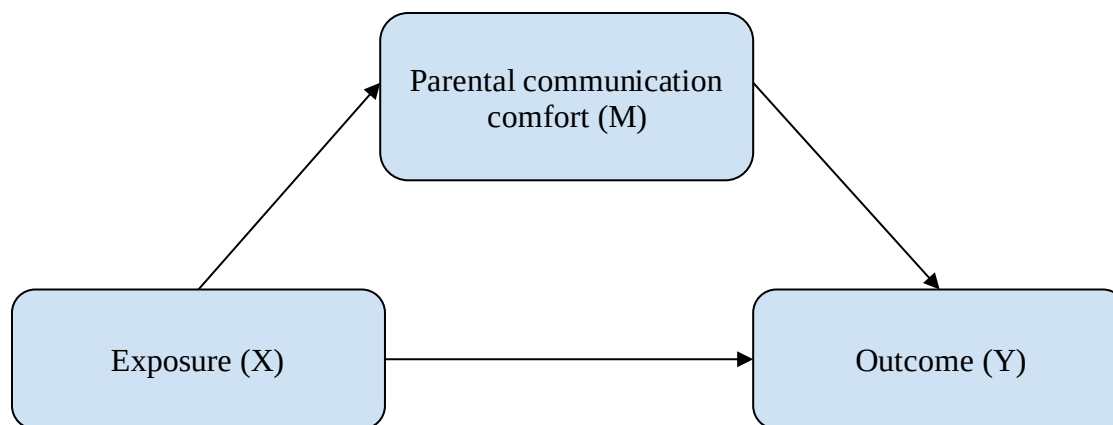


Figure 2: Explanation of mediation analysis

Other independent variables:

Guardians gender norms, guardian menstrual knowledge, menstrual attitude and guardian social norms variables were used as independent variables too. These variables were used from the baseline dataset. During this process, all variables were formed or scored in the same way as when using them as dependent variables.

3.7.3 Operational Definitions

Gender norms score:

This variable was formed as a composite score adapted from the “Guardian survey of AMEHC study (both from baseline and wave 2) and the Attitudes towards Gender Norms Scale (Das et al., 2014)”. Mostly, this variable is built with 5 items, which are:

- “Boys and girls should be equally responsible for household chores (Agree/disagree)”
- “A woman’s role is taking care of her home and family (Agree/disagree)”
- “A woman should obey her husband in all matters (Agree/disagree)”
- “Going to school is more important for boys than it is for girls (Agree/disagree)”
- “Sometimes a husband is annoyed or angered by things that his wife does. In your opinion, is a husband justified in hitting or beating his wife in the following situations... (If she goes out without telling him, if she neglects the children, if she argues with him, if she burns the food, none of the above)”

The items were mostly coded binarily, where 1 represented gender-inequitable or restrictive and 0 represented gender-equitable or progressive. For the items like girls and boys roles in the household and husband obedience were reverse-coded in order to maintain the consistency of gender norms scale. The final composite score was from 0-5, where a higher score is more gender-restrictive and a lower score is more progressive with gender norms.

Guardian menstrual knowledge and attitude score:

To make the menstrual knowledge and attitude score, it adapted items from “AMEHC Guardian Survey of Wave 2” and the Menstrual Attitude Questionnaire (MAQ) by Kawata et al. (2022) to maintain the questions' consistency and alignment. The main items or questions were:

Knowledge-related variables:

- “To reduce pain from menstrual cramping, it is safe for girls to use medication (painkillers) from the (non-homeopathic) pharmacy (true/false/don’t know)”
- “Girls should not go out at night during menstruation to avoid attracting bad spirits (Agree/disagree)”
- “Menstruating women and girls should keep their menstrual materials (the pads, cloth, or other material they use to absorb their menstruation) hidden at all times (Agree/disagree)”
- “Imagine other women in your household kept their menstrual materials in a place where others could see them. Would you still hide your materials? (Agree/disagree)”
- “Do you instruct [girl participant] or anyone in your household instruct you not to attend school during menstruation? (Agree/disagree)”

Attitude-related question:

- “Menstruation is shameful, so women and girls should keep it secret (Agree/disagree)”

The items were coded binarily, where 1 represented better knowledge about menstruation and 0 represented low knowledge about menstruation. While scoring the variables, some variables were reverse-coded in order to maintain the meaning. The final composite score ranged from 0 to 3, where a higher score indicated high menstrual knowledge and a lower score indicated low menstrual knowledge. Moreover, menstrual attitudes had only one variable, which was related to shame related to menstruation. This was also coded as binary 0 as agree or higher shame and 1 as disagree or lower shame related to menstruation.

Guardian social norms score:

This variable was adapted from the “AMEHC Guardian Survey,” and it picked a few relevant items/questions to make the composite score for the variable. The specific items/questions were:

- “Menstruating women and girls should keep their menstrual materials (the pads, cloth or other material they use to absorb their menstruation) hidden at all times (Agree, disagree, no response)”
- “What do you think, in your community, how many parents think that their daughters should keep their menstrual materials hidden at all times? (No parents, less than half of parents, about half of parents, more than half of parents, all parents)”
- “Imagine there are visitors in your home and [the girl participant] had cloth or pads that were visible, how would you react? (Would hide materials, would scold, would punish, would speak to her later, would feel embarrassed/shy, other, no response)”

A composite social norms score was made by adding variables from three different stages. The score was divided into three categories, which were low, moderate, and high. Low referred to progressive attitudes on social norms and high referred to restrictive attitudes on social norms among guardians.

Different stages of scoring:

- Stage 1 (Individual level): When participants agreed with the social norms statement, they received 1 point.
- Stage 2 (Community level): When participants believed “more than half” or “all” community members followed social norms, they received 1 point.
- Stage 3 (Sanctions): Participants got the score depending on their reactions for breaking norms. Participants received 0 points for no reaction, 1 point for mild reactions (embarrassment, or shame, hiding material), and 2 points for severe reactions (physical punishment).

The composite social norm score was created only when the participants shared the valid responses for at least one of the three components (sections) to maintain data integrity.

Girls gender norms score:

This variable was adapted from “Girls surveys of AMEHC study”; there was one section that contained a few questions regarding gender norms. The specific variables were:

- “Boys and girls should be equally responsible for household chores (Agree/disagree)”
- “A woman’s role is taking care of her home and family (Agree/disagree)”
- “A woman should obey her husband in all matters (Agree/disagree)”

The items were mostly coded binarily, where 1 represented gender-inequitable or restrictive and 0 represented gender-equitable or progressive. For the item, girls and boys were equally responsible for household chores; the scores were reverse-coded to maintain the consistency of the gender norms scale. The final composite score ranged from 0 to 3, where a higher score represented more gender-restrictive and a lower score represented more progressive gender norms.

Girl’s social norms score:

To create the girls’ social norms score, the following items/questions from the “Girls survey of the AMEHC study” were used:

- “Do you think girls should keep their menstrual materials hidden at all times? (Yes, no, no response)”
- “What do you think of your class, how many girls’ mothers think that girls should keep their menstrual materials hidden at all times? (No parents, less than half of parents, about half of parents, more than half of parents, all parents)”
- “Imagine there are visitors in your home and your clothes or pads are visible, how would your mother react? (mother would hide materials, mother would scold, mother would punish, mother would explain gently to her later, mother would do nothing, no response, others)”

Girls' social norm scoring was done the same way as the guardians' social norms score. This also had three categories, which were low, moderate, and high. Low referred to progressive attitudes on social norms and high referred to restrictive attitudes on social norms among girls.

Girl’s menstrual knowledge and attitudes score:

This variable was made by making a composite score with the items/questions provided below:

- “Menstruation happens as soon as a girl turns 13 years old (True/false/don’t know)”
- “Menstrual blood comes from the stomach where food is digested (True/false/don’t know)”

- “The menstrual cycle (the number of days between the start of one period until the next period) varies between girls (True/false/don’t know)”
- “For all women and girls, menstruation happens every month on the same date (True/false/don’t know)”
- “Some pain in the lower abdomen during menstruation is normal (True/false/don’t know)”
- “Pregnant women menstruate (True/false/don’t know)”
- “When a girl gets her first period it means it is possible for her to become pregnant (True/false/don’t know)”
- “When washing and before reusing cloths to absorb menstrual blood, drying them in the sun helps to kill bacteria (True/false/don’t know)”
- “To reduce pain from menstrual cramping, it is safe for girls to use medication (painkillers) from the - pharmacy (True/false/don’t know)”
- “Girls should not go out at night during menstruation to avoid attracting bad spirits (True/false/don’t know)”

The items were coded binarily, with 1 representing better knowledge about menstruation and 0 representing low knowledge about menstruation among guardians. During this process, there were variables about safe use of painkillers and basic menstrual concepts that were reverse-coded in order to maintain the consistency of the scoring. The final composite score ranged from 0 to 11 and a higher score indicated high menstrual knowledge, while a lower score indicated low menstrual knowledge.

Girls' menstrual health literacy score (MHL):

This variable was adapted from the “AMEHC Girls Survey,” and it made one composite score of menstrual health literacy. The specific variables were:

- “Do you feel like you have enough information about changes that happen to girls’ bodies during puberty? (Yes, maybe, no, no response)”
- “Do you think you have enough information about how to manage your menstrual bleeding? (Yes, maybe, no, no response)”
- “Do you think you have enough information about strategies to reduce pain during menstruation? (Yes, maybe, no, no response)”

- “Do you think you could get more information about menstruation if you needed to? (Yes, maybe, no, no response)”
- “Do you think you could identify if something was wrong with your menstrual period? (Yes, maybe, no, no response)”
- “If you had a concern about your menstrual period, would you feel comfortable seeking help from a health care provider such as a school nurse, community health worker, or doctor? (Yes, maybe, no, no response)”

This variable was coded as 0 “no”, 1 “maybe” and 2 “yes”. This variable included different aspects like functional knowledge about menstruation, knowledge of resources for need, symptoms recognition and care seeking practice. The total score was from 0 to 6 and it was divided into two categories. Higher the score high menstrual health literacy and lower the score low menstrual health literacy.

3.8 Data Collection

3.8.1 Data Collection Tools

The primary study used structured questionnaires for both girls and guardian surveys and the school checklist. The girls' surveys were in baseline, wave 1, and wave 2; the guardian surveys were in baseline and wave 2, followed by the annual school checklist from 2023 to 2026. Adding to these, all the information has been collected using the electronic tablet with the KoBoToolbox.

The present study focused on the baseline and wave 2 of both the guardian and the girl’s dataset from the whole AMEHC study. The surveys were:

- **Girls Survey:** This survey was used as a structured questionnaire for the baseline and wave 2 data collection. For the baseline girls survey, it collected sociodemographic information, gender norms, self-efficacy, and choices for menstruation, menstruation knowledge, attitudes and practices, school environments, shame and social supports, and both physical and mental health information from the adolescent girls. Moreover, during the wave 2 data collection, it followed through with an equal number of adolescent girls and collected the same set of information.
- **Guardian Survey:** A structured questionnaire was used to collect the guardian information during both baseline and wave 2. The baseline survey collected information regarding the

socio-demographics, children's disabilities, gender norms, menstrual attitudes and norms, and menstruation support as needed. Following that, during wave 2, it collected the same information with some additional information, like healthcare access.

Finally, these datasets helped to track the changes over time regarding adolescent menstruation, social norms & supports, gender norms, reproductive health, and psychosocial well-being among the study population.

3.8.2 Pretesting

The parent study was pretested in 2022 and the tools were modified with multiple phases of pretesting in Khulna, Bangladesh, by involving community stakeholders, qualitative investigation with girls, parents and teachers and cognitive interviews. The pilot survey was conducted with 360 school girls (age 12-16) across 10 schools (co-ed, single sex and madrasa background). Depending on the feedback from pretesting, the tools were modified; specifically, the Menstrual Practice Needs Scale (MPNS) was converted to short form, poorly performing knowledge questions were removed and mental health tools were added based on local acceptance.

This study followed the same questionnaires and the adjustments that were made based on the pretesting period.

3.8.3 Data Collection Procedure

After obtaining ethical approval for the research from the Institutional Review Board (IRB) of BRAC JPGSPH, a data collection process was initiated.

3.9 Data Management and Quality Assurance

The AMEHC study team stored the data in a secure place. The data were only accessible to the core team members through SharePoint. The lead researcher of the present study got access to a portion of the full datasets according to the requirements of the research objectives. Before initiation of the statistical analysis, the data were cleaned carefully in order to get consistent, accurate, and reliable results. Moreover, if there was any missing data, it was dealt with carefully. If the missing values were fewer for a variable, then complete case analysis was performed, and in the case of large missing values, imputation was done.

3.10 Data Analysis

STATA version 17 software was used for data analysis. All hypothesis testing procedures were performed considering a statistical significance level of $p < 0.05$. Depending on the outcome and explanatory variables, different types of statistical analysis were performed. Specific analysis were:

Descriptive analysis:

Descriptive analysis was conducted for the independent and dependent variables to see the frequency and percentages for specific variables from both baseline and wave 2 surveys.

Bivariate analysis:

A chi-square test was conducted to see the changes over time in parental gender and social norms, menstrual knowledge outcomes. The Chi-square test was used because the outcome variables were in categorical form. In addition, for a binary outcome variable (e.g., girls' menstrual health literacy), a logistic regression model was used with one independent variable. The logistic regression model helped to get an odds ratio, which eases the interpretation of the result.

Longitudinal analysis:

A mixed-effect model was performed to examine the association between changes in parental and adolescent girls' gender norms, menstrual health knowledge, attitudes, and practices by using the longitudinal data. The reason for using mixed models was to see the individual level changes in gender norms, social norms and menstrual knowledge among the adolescent girls from their guardians. The model was specified as:

$$Y_{ij} = \beta_0 + \beta_1 X_{ij} + u_{oi} + \epsilon_{ij}$$

Here,

Y_{ij} = Dependent variables, i referred as participants/subject and j referred as wave (time)

β_0 and β_1 = Fixed effect coefficients

X_{ij} = Independent variables

u_{oi} = Random effect

ϵ_{ij} = Residual error terms

[N:B:

Level 1: Used to see changes within the same individuals over different time points (waves)

Level 2: Used to see the difference between different individuals]

The key assumptions tested for model appropriateness were the normality of random effects, independence of residuals and homoscedasticity through the residual check and histogram (Verbeke & Molenberghs, 2001). The post-examination of residuals revealed that the gender norms and menstrual knowledge model successfully fulfil the standard linear assumptions. In both models, level 1 residuals showed homoscedasticity, approximate normality and linearity. However, residual diagnostic models for social norms (Figure 3) showed a left-skewed histogram with a heavy tail, which indicates a substantial ceiling effect. To mitigate the biased estimation and maintain statistical validity, a mixed-effects ordinal logistic regression (meologit) was performed for social norms. During this process, the outcome was defined into three categories (low, moderate and high).

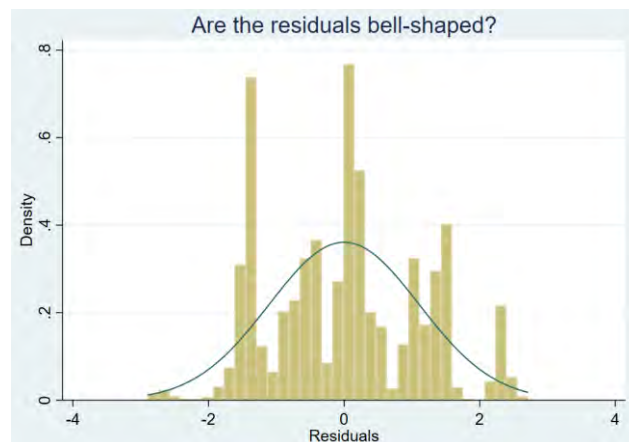


Figure 3: Histogram for social norms residuals

Mediation analysis:

Mediation analysis was conducted by using generalised structured equation modeling (GSEM), to assess whether the parent-daughter communication mediates the relationship between parental menstrual knowledge and adolescent girls' menstrual health literacy outcomes. GSEM was used because of the binary and ordered outcome variables. For doing that, the product-of-coefficients approach was used, followed by bootstrapped (1000 times) confidence intervals.

3.11 Ethical Considerations

Ethical approval for this study was obtained from the Institutional Review Board (IRB) of BRAC James P Grant School of Public Health at BRAC University (Reference number: MPH-2025-008). This study also maintained the privacy, confidentiality, and anonymity of the datasets and stored them in a secure place with limited accessibility. Additionally, as this study was a secondary analysis, it also maintained the conflict of interest among the other partners who were involved in the AMEHC study. Moreover, since this study involved human participants, it followed the standard ethical procedure of the Institutional Review Board and the 1975 Declaration of Helsinki.

Chapter 4: Results

All the tables and figures below are showing the evidence on the basis of different objectives. Specifically, table 1, figure 4 and figure 5 are showing the general and socio-demographic informations about the adolescent girls and their guardians from different time points (baseline and wave 2). Then table 2 is providing the evidence on the basis of objective 1, and table 3 is providing evidence for objective 2. Moreover, table 4.1 is providing some background information for objective 3 and finally table 4.2 is the evidence for objective 3. Last but not the least, table 5.1 and figure 6 are giving ground information for conducting the mediation analysis and finally, table 5.2 is giving the evidence for objective 4 (mediation analysis).

Table 1 presents the participant characteristics of the 2015 adolescent girls and their guardians. The mean age of adolescent girls during baseline was 11.95 years (± 0.0206). Regarding the regions, the girls' participants were primarily from Dumuria (49.63%) and Khulna City Corporation (50.37%). The majority of participants identified them as Muslim (77.32%), followed by Hindu (22.03%), Christian (0.55%), and other religions (0.10%). Concerning guardianship, mothers/females were the primary guardians (94.39%) followed by male or father (5.61%). Mothers' education levels varied, with 21.98% having no education or incomplete primary schooling, 56.19% completing primary or some secondary schooling, 16.70% completing secondary education (O-levels or A-levels), and 5.13% attaining higher education, including vocational training. Fathers' education showed a similar distribution, with 28.16% having no or incomplete primary education, 42.29% completing primary

or some secondary schooling, 20.00% completing secondary education, and 9.55% completing higher education.

Regarding occupational status, most mothers (83.64%) reported no paid employment. Among employed mothers, self-employment accounted for 5.56%, agricultural day labourers 2.11%, non-agricultural day labourers 2.00%, professionals 2.39%, service and sales workers 4.23% and 0.06% other professions. Fathers' occupations were more varied, with 3.37% not employed, 35.78% self-employed, 19.35% agricultural day labourers, 18.40% non-agricultural day labourers, 9.98% professionals, and 13.12% service and sales workers. The household wealth index was distributed relatively evenly across five categories: poorest (20.40%), poor (19.65%), medium (19.95%), wealthy (20.00%), and wealthiest (20.00%).

Table 1: Adolescent Girls' Characteristics during baseline

Socio-demographic Characteristics	Frequency (%)
Girls age	
Mean ($\pm$) SD = 11.95 $\pm$ 0.0206	
Area of residence	
Khulna CC	1015 (50.37)
Dumuria	1000 (49.63)
Religion	
Muslim	1,558 (77.32)
Hindu	444 (22.03)
Christian	11 (0.55)
Others	2 (0.10)

Guardians	
Mothers/female guardians	1902 (94.39)
Father/male guardians	113 (5.61)
Mothers' education	
No education or did not complete primary school	437 (21.98)
Completed primary school (including incomplete secondary schooling)	1117 (56.19)
Completed secondary schooling (o-levels or a-levels)	332 (16.70)
Completed higher education (including vocational training)	102 (5.13)
Father's education	
No education or did not complete primary school	504 (28.16)
Completed primary school (including incomplete secondary schooling)	757 (42.29)
Completed secondary schooling (o-levels or a-levels)	358 (20.00)
Completed higher education (including vocational training)	171 (9.55)
Mothers' occupation	
No paid employment	1503 (83.64)
Self-employed (stall/small business owner/a person who performs work for profit or family gain, in cash or in kind)	100 (5.56)

Agricultural day labourer (a person who works in the agricultural sectors such as in crop production, livestock rearing etc.)	38 (2.11)
Non-agricultural day labourer (a person who works in the non-agricultural sectors such as in manufacturing of goods, handicrafts etc.)	36 (2.00)
Professionals (well-educated workers who enjoy considerable work autonomy and engaged in creative and intellectually challenging work)	43 (2.39)
Service and sales workers	76 (4.23)
Others	1 (0.06)
Fathers' occupation	
No paid employment	60 (3.37)
Self-employed (stall/small business owner/a person who performs work for profit or family gain, in cash or in kind)	638 (35.78)
Agricultural day labourer (a person who works in the agricultural sectors, such as in crop production, livestock rearing, etc.)	345 (19.35)
Non-agricultural day labourer (a person who works in the non-agricultural sectors, such as in manufacturing of goods, handicrafts, etc.)	328 (18.40)
Professionals (well-educated workers who enjoy considerable work autonomy and engaged in creative and intellectually challenging work)	178 (9.98)
Service and sales workers	234 (13.12)
Household wealth Index	
Poorest	411 (20.40)

Poor	396 (19.65)
Medium	402 (19.95)
Wealthy	403 (20.00)
Wealthiest	403 (20.00)
Total observations (N)	2015

Figure 4 illustrated that parental communication comfort in wave 2 was highly skewed, 94.18% of the girls reflected they felt comfortable discussing menstruation with their mothers. This indicates a high initial threshold of communication comfort between mother and daughter. A very limited number of girls reported being less comfortable with their parents and rarely some girls said they were not sure about it. In addition, 64.10% girls showed they had high (>3) menstrual health literacy and 36% girls had low (≤ 3) menstrual health literacy (figure 5).

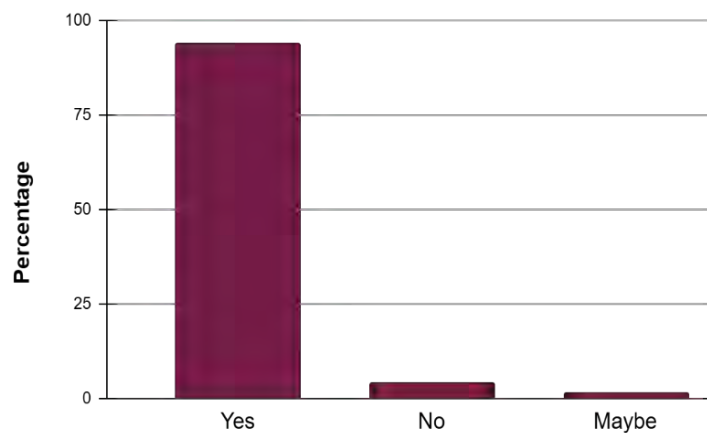


Figure 4: Percentage of parental communication comfort among girls

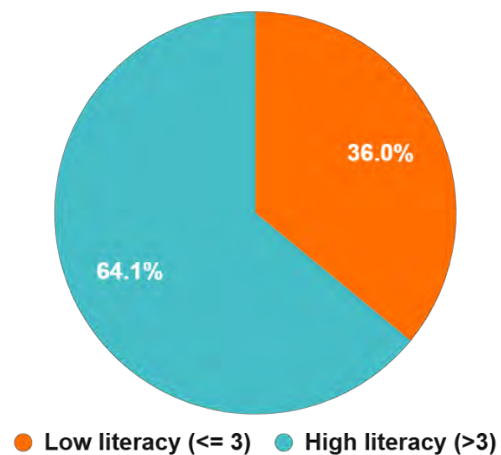


Figure 5: Percentage of girl's menstrual health literacy score

Table 2 represents the frequency and percentage of 1722 guardians' gender norms, social norms, menstrual knowledge and menstrual attitudes both in baseline and wave 2. First of all, in baseline, 9.29% guardians showed 0-1 endorsed, which referred to progressive gender norms, and the highest (44.19%) number of guardians showed 3 endorsed, which referred to restrictive gender norms. On the other hand, in wave 2, 39.78% (the highest) guardians showed 0-1 endorsed (progressive gender norms), and 7.32% guardians showed 4-5 endorsed (restrictive gender norms). So, this (Table 2) illustrates a positive change in gender norms over the years. Specifically, guardians showed improvement towards 0-1 endorsed (more progressive with gender norms) from baseline (9.29%) to wave 2 (39.78%). Similarly, guardians also reduced the percentage for 4-5 endorsed (more restrictive with gender norms) from baseline (19.34%) to wave 2 (7.32%). In addition, the evidence illustrated that the majority of the guardians (44.72%) had moderate knowledge about menstruation at the point of baseline. In wave 2, 46.98% of guardians had moderate knowledge about their menstruation. Therefore, this result suggests positive change in moderate level of menstrual knowledge from baseline (44.72%) to wave 2 (46.98%).

Moreover, Table 2 showed that a higher percentage of guardians (75.04%) hold high attitudes (negative views) towards menstruation like stigma or shame at baseline. Inversely, in wave 2, 69.49% of guardians had high attitudes (negative views) and 30.51% of guardians had low attitudes (positive views) towards menstruation. It reduced the percentage of the high attitudes group from baseline (75.04%) to wave 2 (69.49%) and increased the percentage of the low attitudes group from baseline (24.96%) to wave 2 (30.51%). That means, depending on the time, guardians were progressing their attitudes towards menstruation. Correspondingly, in the baseline, around 67.25% guardians believed moderately (had medium restriction) in social norms on menstruation, followed by 28.15% guardians who believed highly in social norms (more restrictive towards social norms). Also, in wave 2, a higher percentage of guardians (78.75%) belonged to high social norms (more restrictive towards social norms). This result suggested that over time, guardians hold more social restrictions or norms based on menstruation and it increased 28.15% to 78.75% from baseline to wave 2.

Table 2: Changes in guardians' gender and social norms, menstrual knowledge and attitudes between baseline and wave 2

Variables	Baseline	Wave 2
Guardian gender norms	Frequency (%)	Frequency (%)
0-1 endorsed	160 (9.29)	685 (39.78)
2 endorsed	468 (27.18)	500 (29.04)
3 endorsed	761 (44.19)	411 (23.87)
4-5 endorsed	333 (19.34)	126 (7.32)
Guardian menstrual knowledge		
Low	403 (23.40)	452 (26.25)
Moderate	770 (44.72)	809 (46.98)
High	549 (31.88)	461 (26.77)
Guardian menstrual attitude		
High attitude	1287 (75.04)	1196 (69.49)
Low attitude	428 (24.96)	525 (30.51)
Guardian social norms		
Low	79 (4.59)	125 (7.26)
Moderate	1158 (67.25)	241 (14.00)
High	485 (28.15)	1356 (78.75)
Notes: Gender norms: Lower endorsed scores (0-1) indicated more progressive gender norms while higher score (4-5) indicates more restrictive norms. Menstrual knowledge: High indicated good understanding of menstrual concepts, moderate indicated medium level of menstrual concepts and low indicated less understanding or low level of idea about menstruation. Menstrual attitudes: High attitudes referred to negative menstrual perspectives and low attitudes referred to positive or improvement with menstrual perspectives. Social norms: High norms indicated more social restrictions (negative attitudes) regarding menstruations, moderate norms indicated medium level of restriction about menstruation and		

low norms indicated less social restrictions or progressive views (positive attitudes) about menstruation.

Table 3 showed the association between a guardian's gender norms, social norms, menstrual knowledge and attitudes with socio-demographic information (in baseline) such as wealth index or socio-economic status, religion, mother's and father's education. The result showed a significant association with the wealth index, mother's and father's education.

First of all, the wealth index showed a strong significant association with guardian gender norms. When guardians were in the wealthiest categories, it showed they had more progressive views (27.74%) regarding gender norms and less guardians with restrictive views (5.56%). On the other hand, when guardians had the poorest and poor categories, they were more towards restrictive views on gender norms respectively 22.22% (4-5 endorsed) and 29.37% (4-5 endorsed). Besides, menstrual knowledge showed a statistically significant association with wealth index and it showed that when wealth index was better it led to better knowledge about menstruation. Specifically, when the guardians had the wealthy and wealthiest category of socio-economic status, it showed the highest percentage of menstrual knowledge from the guardians respectively 21.91% (wealthy) and 28.63% (wealthiest). But, when guardians had lower socio-economic status, it also impacted on their menstruation knowledge capacity with poorest (22.79%), poor (22.57%) and medium (20.58%). Moreover, Menstrual attitude showed significant positive association with the wealth index. When socio-economic status was higher in categories like wealthy (23.05%) and wealthiest (27.81%), it showed lower menstrual attitudes. Similarly, socio economic status showed positive association with social norms. When guardians have higher socioeconomic status like wealthiest (29.60%) and wealthy (24.80%), they have fewer social norms regarding menstruation.

Secondly, Table 3 showed Muslims guardians (82.53%) had higher menstrual attitudes and had higher social norms perspectives (80.60%) than Hindu/others. Thirdly, Mothers' and fathers' education showed a positive statistical significance with gender and social norms, menstrual knowledge and attitudes. Depending on the increase in the mother's and father's educational level, it showed progressive gender norms views among guardians. Similarly, when mothers' and fathers' education levels increased, it created a positive impact on higher menstrual knowledge level, lower

menstrual attitudes like shame or stigma and reduced social norms. Overall, socio-demographic status showed a positive association with progressive gender norms views and social norms, high menstrual knowledge and low menstrual attitudes.

Table 3: Association between guardians' gender and social norms, menstrual knowledge and attitude with sociodemographic information at baseline

	Gender norms					Menstrual knowledge				Menstrual attitudes			Social Norms			
Wealth index	0-1 endorsed	2 endorsed	3 endorsed	4-5 endorsed	Chi^2, p-value	Low	Moderate	High	Chi^2, p-value	High	Low	Chi^2, p-value	Low	Moderate	High	Chi^2, p-value
Poorest	104 (15.18)	102 (20.40)	112 (27.25)	28 (22.22)	96.09, 0.00	103 (22.79)	174 (21.51)	69 (14.97)	42.55, 0.00	259 (21.66)	86 (16.38)	44.27, 0.00	20 (16.00)	45 (18.67)	281 (20.72)	35.71, 0.00
Poor	103 (15.04)	(119) (23.80)	84 (20.44)	37 (29.37)		102 (22.57)	163 (20.15)	78 (16.92)		265 (22.16)	78 (14.86)		23 (18.40)	37 (15.35)	283 (20.87)	
Medium	126 (18.39)	92 (18.40)	95 (23.11)	25 (19.84)		93 (20.58)	164 (20.27)	81 (17.57)		244 (20.40)	94 (17.90)		14 (11.20)	36 (14.94)	288 (21.24)	
Wealthy	162 (23.65)	95 (19.00)	73 (17.76)	29 (23.02)		82 (18.14)	176 (21.76)	101 (21.91)		238 (19.90)	121 (23.05)		31 (24.8)	55 (22.82)	273 (20.13)	
Wealthiest	190 (27.74)	92 (18.40)	47 (11.44)	7 (5.56)		72 (15.93)	132 (16.32)	132 (28.63)		190 (15.89)	146 (27.81)		37 (29.60)	68 (28.22)	231 (17.04)	
Religion																
Muslim	513 (74.89)	384 (76.80)	324 (78.83)	106 (84.13)	6.13, 0.105	360 (79.65)	626 (77.38)	341 (73.97)	4.24, 0.120	987 (82.53)	340 (64.76)	65.21, 0.00	69 (55.20)	165 (68.46)	1093 (80.60)	53.50, 0.00
Hindu/others	172 (25.11)	116 (23.20)	87 (21.17)	20 (15.87)		92 (20.35)	183 (22.62)	120 (26.03)		209 (17.47)	185 (35.24)		56 (44.80)	76 (31.54)	263 (19.40)	
Mother's education																
No formal education	99 (14.64)	102 (20.61)	114 (27.94)	38 (30.65)	101.72, 0.00	114 (25.91)	173 (21.52)	66 (14.38)	51.19, 0.00	296 (25.00)	57 (11.00)	79.83, 0.00	8 (6.45)	34 (14.29)	311 (23.19)	53.54, 0.00

Completed primary education	361 (53.40)	287 (57.98)	249 (61.03)	76 (61.29)		260 (59.09)	460 (57.21)	253 (55.12)		685 (57.85)	287 (55.41)		69 (55.65)	131 (55.04)	773 (57.64)	
Completed secondary education	152 (22.49)	86 (17.37)	35 (8.58)	10 (8.06)		52 (11.82)	138 (17.16)	93 (20.26)		157 (13.26)	126 (24.32)		31 (25.00)	52 (21.85)	200 (14.91)	
Completed higher education	64 (9.47)	20 (4.04)	10 (2.45)	0 (0)		14 (3.18)	33 (4.10)	47 (10.24)		46 (3.89)	48 (9.27)		16 (12.90)	21 (8.82)	57 (4.25)	
Father's education																
No formal education	130 (21.00)	123 (28.21)	127 (34.32)	48 (43.24)	81.84, 0.00	133 (33.42)	212 (29.32)	83 (20.00)	53.77, 0.00	343 (32.15)	85 (18.16)	63.65, 0.00	12 (10.81)	47 (21.76)	369 (30.52)	52.35, 0.00
Completed primary education	239 (38.61)	194 (44.50)	170 (45.95)	48 (43.24)		180 (45.23)	308 (42.60)	163 (39.28)		462 (43.30)	188 (40.17)		45 (40.54)	88 (40.74)	518 (42.85)	
Completed secondary education	161 (26.01)	83 (19.04)	57 (15.41)	13 (11.71)		60 (15.08)	152 (21.02)	102 (24.58)		193 (18.09)	121 (25.85)		35 (31.53)	44 (20.37)	235 (19.44)	
Completed higher education	89 (14.38)	36 (8.26)	16 (4.32)	2 (1.80)		25 (6.28)	51 (7.05)	67 (16.14)		69 (6.47)	74 (15.81)		19 (17.12)	37 (17.13)	87 (7.20)	
Note: Chi² and p-value (in bold) represented significant association																

Table 4.1 illustrates information about girls' gender norms, menstrual knowledge and social norms between baseline and wave 2. Firstly, 29.62% of girls had 0-1 endorsements which indicated the girls' gender norm towards a progressive direction followed by 64.29% with 2 endorsements (moving towards restrictive gender norms) at baseline. Besides, in wave 2, the results showed an improvement with girl's gender norms perceptions, which referred to 63.72% girls with 0-1 endorsement (progressive views on gender norms), and 29.98% with 2 endorsements (moving towards restrictive views).

Similarly, in baseline, around 62.68% adolescent girls acquired moderate knowledge about menstruation. On the other hand, it increased the percentage of moderate (68.75%) and high levels (26.18%) of knowledge among adolescent girls in wave 2. Furthermore, in the baseline, 58.77% girls had low social norms, and 34.09% girls had high social norms on menstruation. Whereas in wave 2, high social norms (more restrictive) increased among girls (75.67%), and low social norms (progressive views on norms) decreased between adolescent girls (6.74%).

Table 4.1: Changes in girls' gender and social norms, and menstrual knowledge between baseline and wave 2

Variables	Baseline	Wave 2
Girl's gender norms	Frequency (%)	Frequency (%)
0-1 endorsed	510 (29.62)	1031 (63.72)
2 endorsed	1107 (64.29)	485 (29.98)
3 endorsed	105 (6.10)	102 (6.30)
Girl's menstrual knowledge		
Low	475 (29.25)	82 (5.07)
Moderate	1018 (62.68)	1111 (68.75)
High	131 (8.07)	423 (26.18)
Girl's social norms		
Low	1012 (58.77)	116 (6.74)
Moderate	123 (7.14)	303 (17.60)
High	587 (34.09)	1303 (75.67)
Notes: Gender norms: Lower endorsed scores (0-1) indicated more progressive gender norms while higher score (3 endorsed) indicates more restrictive norms. Menstrual knowledge: High indicated good understanding of menstrual concepts, moderate indicated medium level of menstrual concepts and low indicated less understanding or low level of idea about menstruation. Social norms: High norms indicated more social restrictions (negative attitudes) regarding menstruations, moderate norms indicated medium level of restriction about menstruation and		

low norms indicated less social restrictions or progressive views (positive attitudes) about menstruation.

Table 4.2 represents findings from the longitudinal analysis by using the mixed model approach. The crude model (Model 1) was run with the exposure and outcome variables. Later, model 1 was adjusted with girls' age and region from the baseline dataset (Model 2) to see if there was any confounder effect. After that, the model was again run with another set of confounder variables (girls' age and region in wave 2), which was Model 3. The crude model was run with 3340 observations for gender norms, 3240 observations for menstrual knowledge and 3444 observations for social norms with 1772, 1714 and 1722 participants respectively.

First of all, the wave (in crude model) showed statistically significant results in gender and social norms and menstrual knowledge. The results illustrated that gender norms were reduced by 0.45 units on average (individual specific average) from baseline to wave 2. However, menstrual knowledge and social norms increased significantly by respectively 1.86 and 9.48 units on average (individual specific) over the years among girls. The girls' gender norms showed a positive and significant association with both guardians between and within mean score (crude model). The between-person effect ($\beta=0.23$, CI [0.19, 0.26], p-value <0.05) indicated that girls' whose guardians had higher gender norms score, would show more restrictions overall. The within-person effect explained that when guardians' gender norms score increased over time, it also increased gender norms restrictions by 0.10 units for their adolescent girls.

In addition, the guardian's menstrual knowledge level showed a significant association with their adolescent girls' menstrual knowledge (crude model). The between-person effect ($\beta=0.33$, CI [0.21, 0.45], p-value <0.05) explained that girls whose guardians had higher menstrual knowledge scores impacted positively with menstruation. And the within-person effect showed that when guardians had better knowledge scores on menstruation over the years, it increased their adolescent knowledge by 0.13 units on average. Moreover, girls' social norms showed a significant association with their guardians' social norms (crude model). The between-person effect indicated that girls' guardians who had higher social norms, reflected restrictive norms on their overall menstruation. Similarly, the within-person effect indicated that when guardians had higher social norms (restrictive norms)

on menstruation over time, it increased restrictive social norms by 1.37 units on average for their daughters. Furthermore, Table 4.2 revealed that even after adjusting for the confounder variables from both the baseline and wave 2 datasets, the result didn't change dramatically.

Table 4.2: Parental views associated with adolescent girls' endorsement of gender norms, social norms, and menstrual knowledge

	Girl's gender norms			Girl's menstrual knowledge			Girl's social norms		
	$M1^a$	$M2^b$	$M3^c$	$M1^a$	$M2^b$	$M3^c$	$M1^a$	$M2^b$	$M3^c$
	β [95% CI]	β [95% CI]	β [95% CI]	β [95% CI]	β [95% CI]	β [95% CI]	OR [95% CI]	OR [95% CI]	OR [95% CI]
Wave	-0.45 [-0.51, -0.39]	-0.45 [-0.51, 0.39]	-0.46 [-0.52, -0.40]	1.86 [1.73, 1.99]	1.87 [1.74, 2.00]	1.85 [1.72, 1.98]	9.48 [7.69, 11.69]	9.55 [7.76, 11.76]	9.87 [7.96, 12.25]
Average guardian score (between-guardian effect)	0.23 [0.19, 0.26]	0.21 [0.18, 0.25]	0.21 [0.17, 0.25]	0.33 [0.21, 0.45]	0.33 [0.21, 0.45]	0.35 [0.23, 0.47]	1.45 [1.21, 1.72]	1.26 [1.07, 1.49]	1.26 [1.06, 1.50]
Variation within guardian (within guardian effect)	0.10 [0.06, 0.14]	0.99 [0.06, 0.14]	0.10 [0.06, 0.14]	0.13 [0.01, 0.25]	0.13 [-0.52, -0.23]	0.13 [0.01, 0.25]	1.37 [1.16, 1.61]	1.36 [1.16, 1.59]	1.42 [1.20, 1.67]
Age	NA	0.04 [0.01, 0.07]	0.07 [0.05, 0.10]	NA	0.18 [0.10, 0.26]	0.16 [0.08, 0.23]	NA	1.10 [1.80, 2.21]	1.74 [1.57, 1.92]
Region (Dumuria)	NA	0.08 [0.02, 0.13]	0.08 [0.02, 0.14]	NA	-0.37 [-0.52, -0.23]	-0.35 [-0.50, -0.21]	NA	0.64 [0.54, 0.75]	0.60 [0.51, 0.71]
Region (Others)	NA	NA	0.16 [-0.17, 0.48]	NA	NA	-0.17 [-1.33, 0.98]	NA	NA	0.68 [0.25, 1.90]

Constant	1.13 [1.04, 1.22]	0.64 [0.26, 1.01]	0.10 [- 0.30, 0.50]	5.14 [4.97, 5.31]	3.13 [2.12, 4.14]	3.12 [1.99, 4.25]	0.64 [0.39, 1.05]	0.17 [0.04, 0.79]	0.34 [0.15, 0.79]
Number of observation (N)	3340		3236	3240		3143	3444		3236
Participant s (n)	1772		1618	1714		1617	1722		1618

$M1^a$ (Model 1): Crude model

$M2^b$ (Model 2): $Y_{ij} = \beta_0 + \beta_1 (Wave_{ij}) + \beta_2 (Grd\ mean_i) + \beta_3 (Grd\ within_{ij}) + \beta_4 (Age_i) + \sum_{k=2}^m \gamma_k (Region_{ki}) + u_{oi} + \epsilon_{ij}$

$M3^c$ (Model 3): $Y_{ij} = \beta_0 + \beta_1 (Wave_{ij}) + \beta_2 (Grd\ mean_i) + \beta_3 (Grd\ within_{ij}) + \beta_4 (Age_{ij}) + \sum_{k=2}^m \gamma_k (Region_{kij}) + u_{oi} + \epsilon_{ij}$

Y_{ij} = Outcome (Girl's gender norms, social norms and menstrual knowledge between baseline and wave 2)

β_0 = The model intercept

β_1 = The effect of time (baseline vs. wave 2)

β_2 = Between guardian's effects (Guardian's average score between waves)

β_3 = Within guardian's effects (Guardian's deviation from their own average score)

β_4 = Girl's age (continuous adjustment) at baseline/wave 2

$\sum_{k=2}^m \gamma_k (Region_{ki}) / \sum_{k=2}^m \gamma_k (Region_{kij})$ = Girl's region (categorical adjustment at baseline/wave 2)

u_{oi} = Random intercept

ϵ_{ij} = Residual error term

CI: 95% confidence interval

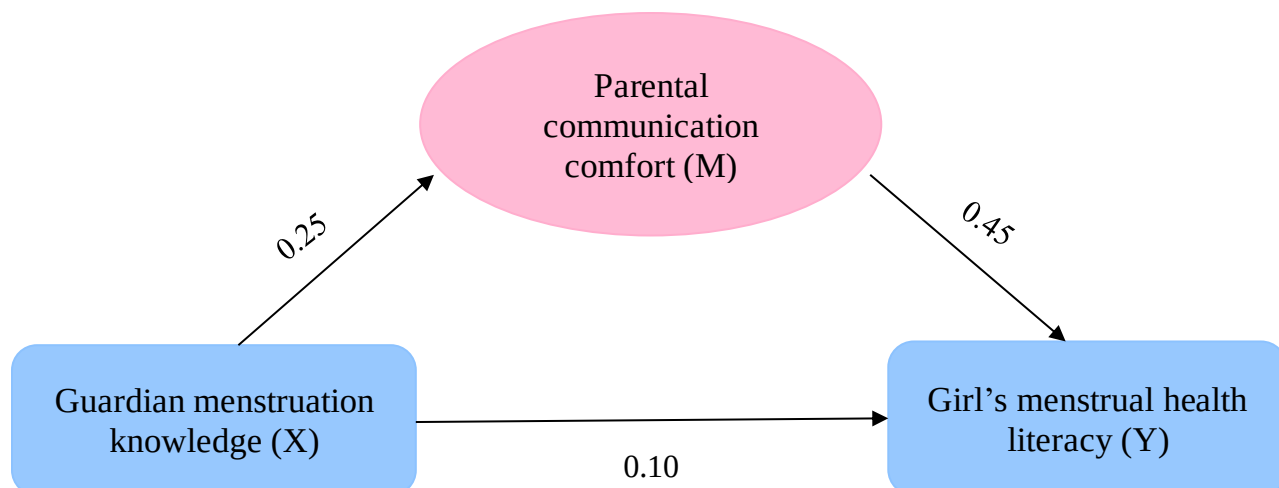
Table 5.1 illustrates the association between guardian menstrual knowledge and girls' menstrual health literacy (moderate level), which was significantly associated with 1722 observations. Guardians with moderate menstrual knowledge had 1.36 times higher odds of getting their girls with positive/better menstrual health literacy than the low knowledge group of guardians (OR = 1.25, 95% CI [1.07, 1.72], $p = 0.012$). This result showed statistically significant menstrual health literacy scores among girls. However, guardians with high menstrual knowledge had 1.26 times higher odds

of getting their girls with positive/better menstrual health literacy than the low knowledge group of guardians (OR = 1.26, 95% CI [0.96, 1.64], $p = 0.09$). But this result did not show any statistically significant result for the menstrual health literacy of girls.

Table 5.1: Association between girls' menstrual health literacy and guardian menstrual knowledge

Girl's menstrual health literacy					
Guardian menstrual knowledge (wave 2)	Odds ratio	p-value	95% confidence interval	Observations	R-squared
Low	ref				
Moderate	1.36	0.012	[1.07, 1.72]	1722	0.0028
High	1.26	0.09	[0.96, 1.64]		
Constant	1.46	0.00	[1.21, 1.76]		

Figure 6 showed the pathways with coefficients for the mediation analysis. The figures represented parental communication comfort as a mediator where the independent variable was guardian menstrual knowledge and outcome was girl's menstrual health literacy.



*Mediation effect or indirect effect β (p-value) = 0.11(0.172)

Figure 6: Mediation analysis pathways

Table 5.2 shows the overall scenario of the mediation analysis. The mediation analysis was conducted to see whether parental communication comfort mediated the relationship between guardians menstrual knowledge and girl's menstrual health literacy. GSEM with bootstrap resampling (1000 replications) was used for estimating the direct and indirect effects. Firstly, path $[X \rightarrow M]$ showed that guardians who had higher menstrual knowledge were 1.28 times more likely to be comfortable with their daughter to talk about menstruation compared to the guardians with lower menstrual knowledge. But this path was not significantly associated or borderline associated ($\beta = 0.25$, $p = 0.07$). In addition, path $[M \rightarrow Y]$ showed statistical significance ($OR = 0.45$, $p < 0.05$). Therefore, the odds of better menstrual health literacy among girls were 1.58 times higher when they had communication comfort with their guardians about menstruation compared to low menstrual health literacy among girls. Moreover, the model estimated a direct exposure and outcome association, which was not statistically significant ($\beta = 0.10$, $p = 0.106$). However, the indirect effect of guardian menstrual knowledge and girls' menstrual health literacy by parental communication comfort showed a positive direction with the association, but not statistically significant ($\beta = 0.11$, $p = 0.172$).

Table 5.2: Mediation analysis with guardian menstrual knowledge and girls' menstrual health literacy (parental communication as a mediator)

Pathways	Coefficient (SE)	OR	p-value
Guardian menstrual knowledge (Grd_MK) → Parental communication comfort (SS5) [X→M]	0.25 (0.136)	1.28	0.07
Parental communication comfort (SS5) → Girl's menstrual health literacy (MHL) [M→Y]	0.45 (0.22)	1.58	0.04
Guardian menstrual knowledge (Grd_MK) → Girl's menstrual health literacy (MHL) [X→Y]	0.10 (0.06)	1.11	0.106
Indirect effect (mediation effect)	0.11 (0.08)	-	0.172
<i>SE-Standard error, OR- Odds ratio, p-value<0.05</i>			

Chapter 5: Discussion

This study examined guardians' perception about gender norms, social norms, menstrual knowledge and attitudes at two different time points and their impact on adolescent girls' menstrual health literacy. More than one-third of the guardians (39.78%) showed positive or progressive views related to gender norms in wave 2 compared to baseline (9.29%). This finding showed a positive direction where guardians were more likely to accept the gender norms facts while considering menstruation. The present study results indicated that more than three-fourths of guardians moved toward more restrictive social norms (high social norm score) perceptions over the years. Also, more than one fourth guardians showed low attitudes (positive perceptions) on menstruation and nearly half (46.98%) of the guardians reported a moderate level of menstrual knowledge at wave 2 and both increased compared to baseline. Additionally, the study showed a positive association between wealth index, mothers and father's education with all of the outcomes. When wealth index (wealthy/wealthiest), mothers' and fathers education improved in baseline, it reduced gender-based

restrictions, social norms-related restrictions and negative menstrual attitudes and increased menstrual knowledge among guardians. Moreover, the result revealed that the changes of parental gender norms, social norms, and menstrual knowledge had an impact on their adolescent girls' perspective by following a mixed model approach. The result significantly reflected that gender norms reduced over time (waves), increased menstrual knowledge and social norms restrictions over the years. This also reflected when guardians had progressive gender and social norms, and better menstrual knowledge, which had a positive association for adolescent girls with progressive gender norms ($\beta = 0.12$, $p < 0.05$), social norms and better menstrual knowledge ($\beta = 0.13$, $p < 0.05$). Furthermore, the mediation analysis explained that the relationship between guardian menstrual knowledge and girls' menstrual health literacy was not mediated by parental communication comfort. However, this null result should be interpreted as a notable ceiling effect in the wave 2 data. It showed the majority of the girls reported higher communication comfort discussing menstruation with their mother and this restricted the variance in these outcome measures. As a result, this insufficient variation restricts the statistical power to detect an incremental effect of the mediator.

First of all, the study findings revealed that guardians' gender norms, social norms, menstrual knowledge and attitude do not remain static, it changes over time. Although guardians are gathering more information on menstruation and it's reducing negative attitudes, there are still barriers depending on the gender or social norms in our community, specifically for women, which leads to restrictive behaviour and actions. One qualitative study stated that “now girls are sharing about menstruation, their products with their friends, but a few years back, we couldn't even whisper about menstruation” (Ampem¹ & Amu, 2026). This indicated that by considering time, gathering sufficient information, and having access to resources help individuals think of menstruation as a natural process. Another guardian stated that “I know time is changing and I learned menstruation as a natural process from health centers, but I was raised with a certain belief which I can't let go” (Ampem¹ & Amu, 2026). Although there are shifts regarding knowledge and attitudes about menstruation, because of social norms and cultural taboos, many mothers hold misconceptions about menstruation.

Then, the result revealed the significant association between gender and social norms, menstrual knowledge and attitudes and socio-demographic status (wealth index, father's and mother's education level and religion). One Indian study found that family income and parental educational level were associated with better menstrual health outcomes (Sachdev et al., 2025). Moreover, another study showed a significant association that Hindu people had better attitudes and practices regarding their menstruation than Muslim or other religious people and nuclear family adolescent girls got better menstrual attitudes and practices than joint family (Deshmukh et al., 2019). However, Deshmukh's study didn't show any association with the mother's and father's educational status. Whereas, the present study illustrated that improvement in menstrual knowledge, attitudes, gender and social norms was significantly varied by socio-demographic status, specifically positive changes observed with parental higher education in baseline.

The present study illustrated that when parental gender and social norms, and menstrual knowledge changes, it impacts their adolescent girls' perspective. A piece of evidence suggests that in LMIC settings, adolescent girls had limited information about menstruation, which made them unprepared for better menstrual management. And the primary reason behind this is that mothers who were the primary source of information had limited knowledge about menstrual health, surrounded with shame, stigma and misconceptions (Chandra-Mouli & Patel, 2017). Interestingly, the study also found that parental gender norms perspective directly influences their children's perspectives related to gender norms, regardless of the children's gender and it impacts attitudes, choices and normative behaviours (Kudrnáč & Davenport, 2025). Adding to the study finding, another study showed that fathers' and mothers' cooperation, housework patterns and spending times, these all impacted positively on their adolescent or child's gender perceptions and role (Cano & Hofmeister, 2023). And this shapes adolescent girls' gender and social norm perspectives, which reflect on their lives and actions. Notably, studies found that mothers were the primary point of menstrual information and knowledge, and one study specifically discovered that the majority (53.45%) of girls had better menstruation knowledge, which they learned from their mother (HP et al., 2025). And this had a positive impression on their menstrual hygiene management too (Ene et al., 2024).

The present study findings indicated that parental communication comfort doesn't mediate the relationship between guardians' menstrual knowledge and girls' menstrual health literacy. Studies

showed that mother-daughter communication is an important source of information and if the communication is good, it helps to improve menstrual literacy among adolescent girls (Zakaria et al., 2019). Some research also indicated that the girls were not comfortable talking about menstruation because of fear and stigma with their guardians (Bosch et al., 2008; Shah et al., 2013). But, Abraham et al (1985) and Lei et al. (1987) stated that 100% of daughters received menstrual knowledge or information from their mothers, but still their girls knowledge score (6.9, range 0-17) is less than their mothers. This means that only ensuring communication or providing information to adolescent girls doesn't guarantee girls' menstrual health literacy. On the other hand, Chandra-Mouli & Patel stated that having formal conversations related to menstruation helps adolescent girls with better menstrual literacy, which is different from our findings (Chandra-Mouli & Patel, 2017). As a result, there is not only a need for open conversation practice regarding menstrual health, but also social and gender related conversations, and ensuring better menstrual facilities, which will help to improve menstrual health literacy for girls.

This present study was conducted on two different waves of the longitudinal data. Researchers should do further research by focusing on three or more time points based on the availability of data. This will help to see a better impact on adolescent girls from their guardians. Additionally, since mothers' perspectives had an impact on their girls, there should be another qualitative study to get more in-depth information about the transformation. Moreover, as the present study showed that there are more guardians who have high social norms, further mixed-method research is needed to understand the root causes of the issues. Furthermore, there should be a study that will only focus on the mediation analysis to see how parental knowledge about menstruation influences girls' menstrual health literacy.

Strengths of the Study

This study followed the longitudinal analysis by using different points of the datasets, both for guardians and girls. It helped to see the changes among guardians' views and perceptions regarding gender, social norms and menstruation knowledge and attitudes. Another key strength of this study used a longitudinal guardian-daughter dataset, which helped to look for both between and within-family differences over time. This analysis not only assesses whether higher levels of guardian menstrual knowledge and gender or social norms were associated with the girls' perceptions, but

also whether changes in parental menstrual knowledge and gender or social norms were linked to the changes in girls' views. This helped to provide evidence on the potential influence of guardians' changes on a girl's menstrual knowledge, and gender or social norms.

Adding to this, the longitudinal analysis was conducted by following a mixed model approach, which helped us to get individual levels of change among guardians and girls. Moreover, this study conducted a mediation analysis to check the actual effect on guardian menstrual knowledge and girls' menstrual health literacy by following parental communication. And this information can be taken into account for implementing any interventions and bringing about policy-level changes for adolescent health.

Limitations of the Study

As this study was based on secondary data, there was less flexibility in changing any questions or taking any new information from the participants. Additionally, there was no opportunity to obtain in-depth responses for some culturally sensitive questions, like social and gender norms. Moreover, as the AMEHC is still an ongoing study, and for my study, I focused on specific waves; there may be additional dimensions of adolescent menstruation (e.g., systematic patterns) that can be explored after the study concludes.

Implications for Public Health Policy and Practice

All the findings have significant implications for policymaking, programme implementations and driving to new adolescent health interventions. The results from the present study showed the importance of parental views on gender and social norms, menstrual knowledge and attitudes and its effect on their adolescent girls. By using the finding, policymakers can integrate different programs by focusing on menstrual and reproductive health. Besides, as there are still social and gender norms in the community, there is a need for community-based interventions. It will help adolescent girls to improve their reproductive health by ensuring family and health workers support. Lastly, there should be different workshops, seminars where parents can be involved in order to gather more information on menstruation to share with their adolescent girls.

Chapter 6: Conclusion and Recommendations

6.1 Conclusion

Guardians play a crucial role in shaping adolescent girls' views & perspectives, particularly significant in sensitive subjects like menstruation, gender and social norms related to menstruation. And these perceptions change depending on multiple factors such as time, socio-demographic status, and parental communication comfort. Depending on the society, cultures, and country, there are many existing gender and social norms, attitudes, knowledge gaps and practices regarding menstruation. And these norms or cultures shaped adolescent girls' menstrual and reproductive health. As a result, it slowly impacts the overall health & wellbeing of adolescent girls. To tackle the issue, better parental perceptions and support for their daughter can bring a positive attitude towards menstruation; eventually, it will build better menstruation management for them. Also, by ensuring culturally appropriate interventions would help to reduce the stigma/norms and increase menstruation knowledge levels among girls and guardians, which will create an equitable and inclusive society for all.

6.2 Recommendations

Based on the study findings, the recommendations are:

1. First of all, there needs to be community-led or school-specific workshops where guardians will be trained on how to communicate with their girls with comfort while discussing or introducing menstrual and reproductive health. This will help the guardians to build better connections with their adolescent girls and help to build a stigma-free society.
2. The policymaker should implement quality of information through educational programs. This will help the adolescent girls to gather accurate information to manage their menstruation comfortably. Mostly, the required information related to menstrual biology, MHM, importance of psychosocial support, and reproductive knowledge.
3. Context-specific programs should be implemented by the local government to reduce stigma and taboo regarding menstruation. Different groups of community leaders like religious leaders, teachers, and civic workers can come together to help with the programs.

4. Ensuring additional information support to the adolescent girls would help the girls to get sufficient information about menstruation. From the findings, it is suggested that many girls have a low level of menstrual knowledge and this might affect their menstrual and reproductive health. As a result, if those girls get support from schools or healthcare providers, it will help them acquire information so that they can manage their menstruation in a good manner.
5. There should be a qualitative study to support the finding that actually, how the gender and social norms, menstrual knowledge and attitudes change in girls depending on their guardians' perspectives. This will help to understand the bigger picture behind cultural and societal problems related to menstruation.

Declaration of GenAI Use

I, Sadia Aktar Silvia, declare that in preparing this assignment, I used ChatGPT (OpenAI, version, and date) as a support tool to assist with brainstorming ideas, getting thoughts on conceptualizations, organising the structure of my writing (suggestions from Grammarly), getting ideas for different statistical analysis, generating code if necessary and improving clarity and language in the text that I drafted myself. GenAI was not used to generate original arguments, interpret results, or produce final academic content. All substantive ideas, judgments, references, and conclusions are my own and have been independently verified in line with JPGSPH academic integrity guidelines.

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Appendices

Appendix A: Data Collection (variable metrics)

Data Sources (Survey)	Section/Category	Variable Name	Questions
Guardian Baseline Survey	Demographic	Relationship	Relationship to the [girl] participant
		HHSIZE	How many members of your household are there?
		Religion	What is your religion?
		Education_highest	What is the highest level of education you have completed?
		Education_mother	What is the highest level of education your wife has completed?
		Education_father	What is the highest level of education your husband has completed?
		Education_mother2	What is the highest level of education that the [girl participant's] mother has completed

		Employment	What is your occupation?
		Employment_mother	What is your wife's occupation?
		Employment_father	What is your husband's occupation?
		DHS1	What is the main source of drinking water for members of your household?
		DHS2	What kind of toilet facility do members of your household usually use?
		DHS3	Where is this toilet facility located?
		DHS4	Do you share this toilet facility with other households or the public?
		DHS5	Does this household own any livestock, herds, other farm animals, or poultry?
		DHS6	Does any member of this household own any homestead?
		DHS7	Main material of the exterior floor of the dwelling.

		DHS8	Material of the roof of the dwelling.
		DHS9	Main material of the exterior walls of the dwelling.
		DHS10	What type of fuel does your household mainly use for cooking?
		DHS11	Does your household have: Electricity, solar electricity, radio, sewing machine, fan, wardrobe/almirah, motorcycle/motor scooter, boat, internet, refrigerator, television, IPS/generator, computer/laptop/tab, mobile phone, air conditioner, truck/bus/taxi/car, CNG/auto-bike/tempo, bicycle, rickshaw/van
		HWISE1	In the last 4 weeks, how frequently has your main water source been interrupted or limited (e.g., water pressure, less water than expected, high salinity)?
		HWISE2	In the last 4 weeks, how frequently have you or anyone in your household had to go without washing their body because of problems with water (e.g., not enough water, dirty, unsafe)?
	Disability (of their child)	D1	Does she have difficulty seeing, even if wearing glasses?

		D2	Does she have difficulty hearing, even if using a hearing aid?
		D3	Does she have difficulty walking or climbing steps?
		D4	Does she have difficulty remembering or concentrating?
		D5	Does she have difficulty with self-care, such as washing all over or dressing
		D6	Using her usual language, does she have difficulty communicating, for example understanding or being understood
	Section_GN (Gender norms)	GN1	Boys and girls should be equally responsible for household chores
		GN2	A woman's role is taking care of her home and family
		GN3	A woman should obey her husband in all matters
		GN4	Going to school is more important for boys than it is for girls

		GN5	Sometimes a husband is annoyed or angered by things that his wife does. In your opinion, is a husband justified in hitting or beating his wife in the following situations...
	Section_AN: Menstruation, Attitudes & norms	C1	How comfortable do you feel discussing menstruation with [the girl participant]?
		MenarcheK	Thinking back to your own experience, before you had your first menstrual period, were you aware of menstruation?
		KM2	To reduce pain from menstrual cramping, it is safe for girls to use medication (painkillers) from the (non-homeopathic) pharmacy
		KT1	Girls should not go out at night during menstruation to avoid attracting bad spirits
		KR3_1	From one menstrual period to the next, there are certain days when a woman is more likely to become pregnant.
		KR3_2	Is this time just before her period begins, during her period, right after her period has ended, or halfway between two periods?
		MS5	Menstruation is shameful, so women and girls should keep it secret
		N1a	Menstruating women and Girls should keep their menstrual materials (the pads, cloth or

			other material they use to absorb their menstruation) hidden at all times
		N1c	What do you think, in your community how many parents think that their daughters should keep their menstrual materials hidden at all times?
		N1d	Thinking about girls attending [the girl participants' school], how many do you think actually keep their menstrual materials hidden at all times?
		N1e	Imagine there are visitors in your home and [the girl participant] had cloth or pads that were visible, how would you react?
		N2a	Do you think girls should go to school during menstruation?
	Section_En: Support for menstruation	SEN3	If your daughter or someone in your family had a concern about their period, do you think that local health care providers are knowledgeable about this topic to help them?
		Access	Do you find that sanitary pads are always available when you want to buy them (for yourself or someone in your household)?
		Afford	What do you think, are the current cost of sanitary pads affordable for your household?

Guardian W2 Survey	Demographics	Relationship	Relationship to the [girl] participant
		Employment	What is your occupation?
		Employment_mother	What is your wife's occupation?
		Employment_father	What is your husband's occupation?
		DHS1	What is the main source of drinking water for members of your household?
		DHS2	What kind of toilet facility do members of your household usually use?
		DHS3	Where is this toilet facility located?
		DHS4	Do you share this toilet facility with other households or the public?
		DHS5	Does this household own any livestock, herds, other farm animals, or poultry?
		DHS6	Does any member of this household own any homestead?

		DHS7	Main material of the exterior floor of the dwelling.
		DHS8	Material of the roof of the dwelling.
		DHS9	Main material of the exterior walls of the dwelling.
		DHS10	What type of fuel does your household mainly use for cooking?
		DHS11	Does your household have: Electricity, solar electricity, radio, sewing machine, fan, wardrobe/almirah, motorcycle/motor scooter, boat, internet, refrigerator, television, IPS/generator, computer/laptop/tab, mobile phone, air conditioner, truck/bus/taxi/car, CNG/auto-bike/tempo, bicycle, rickshaw/van
		HWISE1	In the last 4 weeks, how frequently has your main water source been interrupted or limited (eg, water pressure, less water than expected, high salinity)?
		HWISE2	In the last 4 weeks, how frequently have you or anyone in your household had to go without washing their body because of problems with water (eg, not enough water, dirty, unsafe)?

	Health Care Access	HCA1	How long does it take (in minutes) to go from your home to the nearest healthcare facility, which could be a hospital, health clinic or chamber of a medical doctor?
		HCA2	Many different factors can prevent people from getting medical advice or treatment for themselves. When you are sick and want to get medical advice or treatment, is each of the following a big problem or not a big problem
		HCA2_1	Getting money needed for advice or treatment
		HCA2_2	The distance to the health facility
		HCA2_3	Not wanting to go alone
		HCA2_4	Getting permission to go to the doctor
		HCA2_5	Long queue or crowded outpatient department
		HCA2_6	Concerned that health care provider will not be knowledgeable or sensitive to your problem

		HCA2_oth	Other factors that are a barrier to seeking medical advice
	Section_GN: Gender norms	GN1	Boys and girls should be equally responsible for household chores
		GN2	A woman's role is taking care of her home and family
		GN3	A woman should obey her husband in all matters
		GN4	Going to school is more important for boys than it is for girls
		GN5	Sometimes a husband is annoyed or angered by things that his wife does. In your opinion, is a husband justified in hitting or beating his wife in the following situations...
	Section_AN: Menstruation, Attitudes & norms	C1	How comfortable do you feel discussing menstruation with [the girl participant]?
		KM2	To reduce pain from menstrual cramping, it is safe for girls to use medication (painkillers) from the (non-homeopathic) pharmacy
		KT1	Girls should not go out at night during menstruation to avoid attracting bad spirits

		KR3_1	From one menstrual period to the next, there are certain days when a woman is more likely to become pregnant.
		KR3_2	Is this time just before her period begins, during her period, right after her period has ended, or halfway between two periods?
		KB6	Women naturally stop menstruating around age 50
		KB7	In the time before a woman's periods stop, she may experience symptoms like hot flashes or sweating at night
		KT3	Challenges with menstruation like pain or changes to bleeding happen when women and girls fail to avoid [bad wind]
		MS5	Menstruation is shameful, so women and girls should keep it secret
		N1a	Menstruating women and girls should keep their menstrual materials (the pads, cloth or other material they use to absorb their menstruation) hidden at all times
		N1c	What do you think, in your community how many parents think that their daughters should keep their menstrual materials hidden at all times?

		N1e	Imagine there are visitors in your home and [the girl participant] had cloth or pads that were visible, how would you react?
		N1f	Do you keep your menstrual materials hidden from people in your family?
		N1g	Imagine other women in your household kept their menstrual materials in a place where others could see them. Would you still hide your materials?
		N2a	Do you think girls should go to school during menstruation?
		NS1	Do you instruct [girl participant] not to attend school during menstruation?
	Section_En: Support for menstruation (female guardian perspectives)	Grd_MHL	Do you feel that you have enough information about menstruation? [Including how menstruation changes over women's lives, managing symptoms associated with menstruation, and menstrual management?]
		Grd_MHL_info	What would you most like more information about?
		Grd_MHL_source	If you wanted to know more about menstruation, where would you go for information?

		Grd_MHC1	Have you ever sought advice or treatment for a concern related to your menstruation?
		Grd_MHC2	What did you seek support for?
		Grd_MHC3	Did you receive any treatment for your concern?
		Grd_MHC4	What treatment did you receive?
		Grd_PH4	If [girl participant] has experienced concerns related to her menstruation, has she sought advice from a health care provider?
		SEN3	If your daughter or someone in your family had a concern about their period, do you think that local health care providers are knowledgeable about this topic to help them?
		Access	Do you find that sanitary pads are always available when you want to buy them (for yourself or someone in your household)?
		Afford	What do you think, are the current cost of sanitary pads affordable for your household?
	Menstrual symptoms	PPST1	Do you often experience pelvic/abdominal or lower back pain before or during your periods?

		P2	How severe is this pain? Would you say it was mild pain, moderate pain, or severe pain?
		PPST2	Does this pain limit your activities or require medication?
		P4	Were you able to reduce your menstrual (menstruation-related) pain during your most recent menstrual period?
		HMB2	Do you experience 3 or more days of heavier menstrual bleeding during your menstrual period?
		HMB3	In general, does menstruation bother you due to its abundance?
		HMB6	In general, during your heavier menstrual bleeding days, do you avoid, as far as possible, some activities, trips, or leisure-time plans because you frequently need to change your menstrual materials?
Baseline Girls Survey	Demographics	Religion	What is your religion?
		Age	How old are you?
		HHComp	Who lives together with you in your home?

	Section_GN: Gender norms	GN1	Boys and girls should be equally responsible for household chores
		GN2	A woman's role is taking care of her home and family
		GN3	A woman should obey her husband in all matters
	Section_CSE: Choice and self-efficacy	GSE1	You believe you can succeed at thing you set your mind to Backtranslation: Whatever you want to do, you believe you can succeed on that.
		GSE2	[In general, you think you can obtain outcomes that are important to you] Backtranslation note: In general, you believe you can achieve what you want in life
	Section_M: Menstruation 1	M4	When was your first menstrual period? [Enumerator note: if she does not know the month, provide best guess]
		M1	[if she has not experienced menstruation]
		M1_who	Where did you hear about menstruation?

	Menarche Experience	M3	Before you had your first menstrual period, were you aware of menstruation?
		Men1	Do you feel that you were prepared for your first menstrual period?
		Men2	When you had your first menstrual period, did you talk to anyone about it?
		Men2_ who	Who did you talk to? Anyone else?
		Men2_ what	What support did they provide?
		Men3	Thinking about your first menstrual period, please look at the 6 words on your survey Which two words do you think best describe how you felt during your first period.
	Section_MK: Menstrual knowledge: Menstrual biology	KB1	Menstruation happens as soon as a girl turns 13 years old
		KB2	Menstrual blood comes from the stomach where food is digested
		KB3	The menstrual cycle (the number of days between the start of one period until the next period) varies between girls

		KB4	For all women and girls, menstruation happens every month on the same date
		KB5	Some pain in the lower abdomen during menstruation is normal
	Links with reproduction	KR1	Pregnant women menstruate
		KR2	When a girl gets her first period, it means it is possible for her to become pregnant
	Practical management	KM1	When washing and before reusing cloths to absorb menstrual blood, drying them in the sun helps to kill bacteria
		KM2	To reduce pain from menstrual cramping, it is safe for girls to use medication (painkillers) from the - pharmacy
	Myths/taboo	KT1	Girls should not go out at night during menstruation to avoid attracting bad spirits
		KT2	Menstruating women and girls should not prepare food for the family as it can harm them
	Section_MHL: Menstrual health literacy	MHL1	Do you feel like you have enough information about changes that happen to girls' bodies during puberty?

		MHL2	Do you think you have enough information about how to manage your menstrual bleeding?
		MHL3	Do you think you have enough information about strategies to reduce pain during menstruation?
		MHL4	Do you think you could get more information about menstruation if you needed to?
		MHL5	Do you think you could identify if something was wrong with your menstrual period?
		MHL6	If you had a concern about your menstrual period, would you feel comfortable seeking help from a health care provider such as a school nurse, community health worker, or doctor?
	Section_MPQ: Menstrual practices	MPQ1	During your most recent menstrual period, what were all the materials [items] you used to catch or absorb your menstruation?
		MPQ3	Who paid for your menstrual materials during your most recent period?
		MPQD	During your most recent period, who made the decision about the materials you use to absorb or catch menstrual blood?

		MPQ11	Did you wash and reuse any menstrual materials during your most recent period?
	Section_MPNS : Menstrual Practice Needs Scale	MPN1	During your most recent menstrual period, Were your menstrual materials comfortable?
		MPN2	During your most recent menstrual period, did you have enough menstrual materials to change them as often as you wanted to?
		MPN5	During your most recent menstrual period... Were you worried that your menstrual materials would allow blood to pass through to your outer garments?
		MPN7	During your most recent menstrual period... Were you worried about how you would get more of your menstrual material if you ran out?
		MPN11	During your most recent menstrual period... Were you able to wash your hands when you wanted to?
		MPN13	During your most recent menstrual period... Were you able to dispose of your used materials in the way that you wanted to?
		MPN15	During your most recent menstrual period... Were you concerned that others would see your used menstrual materials in the place you disposed of them?

		MPNS_home	The next few questions ask you about your experience of your most recent menstrual period when you were at home.
		MPN16	When at home during your most recent period... Were you able to change your menstrual materials when you wanted to?
		MPN17	When at home during your most recent period... Were you satisfied with the place you used to change your menstrual materials?
		MPN20	When at home during your most recent period... Were you worried that someone would see you while you were changing your menstrual materials?
		MPN21	When at home during your most recent period... Were you worried that someone would harm you while you were changing your menstrual materials?
		MPN29	During your most recent menstrual period... Did you have enough water and soap (detergent, laundry powder, detol) to wash your menstrual materials?
		MPN31	During most recent last menstrual period... Were you able to wash your

			menstrual materials when you wanted to?
		MPN35	During your most recent menstrual period... Were you worried that your menstrual materials would not be dry when you needed them?
		MPN36	During your most recent menstrual period... Were you worried that others would see your menstrual materials while they were drying?
	Section_AN: Attitudes & norms	A1	What do you think, does getting your period impact your day? (backtranslation: regular/daily activities, mental condition)
		N1a	Do you think girls should keep their menstrual materials hidden at all times?
		N1b	What do you think, of the girls in your class, how many think that girls should keep their menstrual materials hidden at all times?
		N1c	What do you think, of your class, how many girls' mothers think that girls should keep their menstrual materials hidden at all times?
		N1d	Thinking about girls in your class, how many do you think actually keep their menstrual materials hidden at all times?

		N1e	Imagine there are visitors in your home and your cloth or pads are visible, how would your mother react?
		N2a	Do you think girls should go to school during menstruation?
		N2c	If we asked this question to your mother, what do you think she would say, Does she think girls should go to school during menstruation?
	Section_C: Confidence	C1	How confident do you feel that you can manage your menstruation [pad yourself, change your materials, dispose of them or wash and dry them] when you are at home?
	Section_Ph: Physical health	PH1	Have you ever experienced itching or burning in your genital area?
		PH2	In past three months, have you experienced itching or burning in your genital area
		PH3	Have you ever consulted a health care provider about symptoms in your genitals?
		PH4	Have you ever discussed menstruation with a health care provider?
	Section_ISS: Shame	MS1	When I'm menstruating, I feel ashamed

		MS2	When I'm menstruating, I feel unclean or disgusting
		MS3	When I am menstruating, I feel alone
		MS4	I feel bad if I miss school because of my period
	Section_SS: Social support	SS1	You have a parent/guardian who would help you with your problems and troubles if you needed
		SS2	You have a parent or guardian who accepts you as you are
		SS3	You have a parent or guardian who trusts you to make the right decisions
		SS4	You have a parent/guardian who helps you achieve your goals in life
		SS5	Do you have someone in your household you feel comfortable asking for support (advice, resources, emotional support) for your period?
		SS6	Do you have someone at school you feel comfortable asking for support (advice, resources, emotional support) for your period?

W2 Girls Survey	Demographics	Class	What class are you attending this year?
		Age	How old are you?
		HH_guardian	Who is the person who most looks after or takes care of you? This is sometimes called your primary or main caregiver
	Section_GN: Gender norms	GN1	Boys and girls should be equally responsible for household chores
		GN2	A woman's role is taking care of her home and family
		GN3	A woman should obey her husband in all matters
	Section_CSE: Choice and self-efficacy	GSE1	You believe you can succeed at thing you set your mind to Backtranslation: Whatever you want to do, you believe you can succeed on that.
		GSE2	[In general, you think you can obtain outcomes that are important to you] Backtranslation note: In general, you believe you can achieve what you want in life
	Section_M: Menstruation 1	M4	When was your first menstrual period?

		M1	[if she has not experienced menstruation] Enumerator: Does the participant know about menstruation?
		M1_who	Where did you hear about menstruation?
	Menarche Experience	M3	Before you had your first menstrual period, were you aware of menstruation?
		Men1	Do you feel that you were prepared for your first menstrual period?
		Men2	When you had your first menstrual period, did you talk to anyone about it?
		Men2_ who	Who did you talk to? Anyone else?
		Men2_ what	What support did they provide?
		Men3	Thinking about your first menstrual period, please look at the 6 words on your survey Which two words do you think best describe how you felt during your first period.
	Section_MK: Menstrual	KB1	Menstruation happens as soon as a girl turns 13 years old

	knowledge: Menstrual biology	KB2	Menstrual blood comes from the stomach where food is digested
		KB3	The menstrual cycle (the number of days between the start of one period until the next period) varies between girls
		KB4	For all women and girls, menstruation happens every month on the same date
		KB5	Some pain in the lower abdomen during menstruation is normal
	Links with reproduction	KR1	Pregnant women menstruate
		KR2	When a girl gets her first period it means it is possible for her to become pregnant
	Practical management	KM1	When washing and before reusing cloths to absorb menstrual blood, drying them in the sun helps to kill bacteria
		KM2	To reduce pain from menstrual cramping, it is safe for girls to use medication (painkillers) from the pharmacy
	Myths/taboo	KT1	Girls should not go out at night during menstruation to avoid attracting bad spirits

		KT2	Menstruating women and girls should not prepare food for the family as it can harm them
	Section_MHL: Menstrual health literacy	MHL1	Do you feel like you have enough information about changes that happen to girls' bodies during puberty?
		MHL2	Do you think you have enough information about how to manage your menstrual bleeding?
		MHL3	Do you think you have enough information about strategies to reduce pain during menstruation?
		MHL4	Do you think you could get more information about menstruation if you needed to?
		MHL5	Do you think you could identify if something was wrong with your menstrual period?
		MHL6	If you had a concern about your menstrual period, would you feel comfortable seeking help from a health care provider such as a school nurse, community health worker, or doctor?
	Section_MPQ: Menstrual practices	MPQ1	During your most recent menstrual period, what were all the materials [items] you used to catch or absorb your menstruation?

		MPQ3	Who paid for your menstrual materials during your most recent period?
		MPQD	During your most recent period, who made the decision about the materials you use to absorb or catch menstrual blood?
		MPQ11	Did you wash and reuse any menstrual materials during your most recent period?
	Section_MPNS : Menstrual Practice Needs Scale	MPN1	During your most recent menstrual period, Were your menstrual materials comfortable?
		MPN2	During your most recent menstrual period Did you have enough menstrual materials to change them as often as you wanted to?
		MPN5	During your most recent menstrual period... Were you worried that your menstrual materials would allow blood to pass through to your outer garments?
		MPN7	During your most recent menstrual period... Were you worried about how you would get more of your menstrual material if you ran out?
		MPN11	During your most recent menstrual period... Were you able to wash your hands when you wanted to?

		MPN13	During your most recent menstrual period... Were you able to dispose of your used materials in the way that you wanted to?
		MPN15	During your most recent menstrual period... Were you concerned that others would see your used menstrual materials in the place you disposed of them?
		MPNS_home	The next few questions ask you about your experience of your most recent menstrual period when you were at home.
		MPN16	When at home during your most recent period... Were you able to change your menstrual materials when you wanted to?
		MPN17	When at home during your most recent period... Were you satisfied with the place you used to change your menstrual materials?
		MPN20	When at home during your most recent period... Were you worried that someone would see you while you were changing your menstrual materials?
		MPN21	When at home during your most recent period...

			Were you worried that someone would harm you while you were changing your menstrual materials?
		MPN29	During your most recent menstrual period... Did you have enough water and soap (detergent, laundry powder, Dettol) to wash your menstrual materials?
		MPN31	During most recent last menstrual period... Were you able to wash your menstrual materials when you wanted to?
		MPN35	During your most recent menstrual period... Were you worried that your menstrual materials would not be dry when you needed them?
		MPN36	During your most recent menstrual period... Were you worried that others would see your menstrual materials while they were drying?
	Section_AN: Attitudes & norms	A1	What do you think, does getting your period impact your day?
		Ramadan	If you observed fasting during Ramadan, did you hide that you were eating to hide [cover] your menstruation?
		N1a	Do you think girls should keep their menstrual materials hidden at all times?

		N1b	What do you think, of the girls in your class, how many think that girls should keep their menstrual materials hidden at all times?
		N1c	What do you think, of your class, how many girls' mothers think that girls should keep their menstrual materials hidden at all times?
		N1d	Thinking about girls in your class, how many do you think actually keep their menstrual materials hidden at all times?
		N1e	Imagine there are visitors in your home and your clothes or pads are visible, how would your mother react?
		N1f	Do you keep your menstrual materials hidden from people in your family?
		N1g	Imagine your mother kept her menstrual materials in a place where other members of the family could see them. Would you still hide your materials?
		N2a	Do you think girls should go to school during menstruation?
		N2c	If we asked this question to your mother, what do you think she would say, Does she think girls should go to school during menstruation?

		NS1	Does anyone in your household instruct you not to attend school during your menstrual period?
	Section_C: Confidence	C1	How confident do you feel that you can manage your menstruation [pad yourself, change your materials, dispose of them or wash and dry them] when you are at home?
	Section_Ph: Physical health	PH2	In past three months, have you experienced itching or burning in your genital area
		PH3	In the past year have you consulted a health care provider about symptoms in your genitals?
		PHT5	In the past three months have you experienced discharge from your vagina that is different to normal (for example, it has an unusual texture and color, e.g., it is chalky, has the consistency of yogurt or cottage cheese, or is grey, green, or yellow discharge)?
		PH6	In the past month, have you experienced unpleasant or fishy odour from your genitals?
	Section_ISS: Shame	MS1	When I'm menstruating, I feel ashamed
		MS2	When I'm menstruating, I feel unclean or disgusting

		MS3	When I am menstruating, I feel alone
	Section_SS: Social support	SS1	You have a parent/guardian who would help you with your problems and troubles if you needed
		SS2	You have a parent or guardian who accepts you as you are
		SS3	You have a parent or guardian who trusts you to make the right decisions
		SS4	You have a parent/guardian who helps you achieve your goals in life
		SS5	Do you have someone in your household you feel comfortable asking for support (advice, resources, emotional support) for your period?
		SS6	Do you have someone at school you feel comfortable asking for support (advice, resources, emotional support) for your period?