

Health and Disease among Adolescent Urban School Girls in Bangladesh

Tahmina Banu^{1*}
Tanvir Kabir Chowdhury²
Tasmiah Tahera Aziz¹
Nowrin Tamanna¹
Arni Das¹
Nugayer Sharmeen¹
Sanchita Roy¹
Durdana Sadab¹
Sabbir Ahmed¹

¹Chittagong Research Institute for Children Surgery
Chattogram, Bangladesh.

²Department of Pediatric Surgery
Chittagong Medical College
Chattogram, Bangladesh.

*Correspondence to:

Dr. Tahmina Banu

Director

Chittagong Research Institute for Children Surgery

Chattogram, Bangladesh

Mobile : +88 01711 72 06 35

Email : profahmina@gmail.com

Date of Submission : 02.12.2021

Date of Acceptance : 28.12.2021

www.banglajol.info/index.php/CMOSHMCJ

Abstract

Background: Adolescence is an important phase of life and adolescent girls have specific health related problems. The aim of the study was to address the health-related issues of urban school going adolescent girls from a lower-middle income country.

Materials and methods: A cross-sectional study was performed among 1315 school high-school girls. Demographic and socioeconomic parameters were recorded and health related behaviours and problems analysed.

Results: Age ranged from 10 to 17 years. Immunization and deworming rates were 98.17% and 57.41%, respectively and deworming significantly reduced in higher classes ($p=0.00$). Major physical complaints were eye problems (583, 44.33%), allergy to various substances (500, 38.02%), headache (435, 33.08%) and menstrual problems (334, 25.40%). Obesity and overweight were significantly more in higher classes and underweight in lower classes ($p<0.01$).

Conclusion: Diverse and serious health related undiagnosed problems prevail among girls' high school. Malnutrition, ocular problems, menstrual problems and headaches are major areas of concerns.

Key words

Adolescent; Allergy; Deworming; Malnutrition; Menstrual problem; School children.

INTRODUCTION

World Health Organization (WHO) defines adolescence as the period of life between 10 and 19 years of age and about 16% (1.2 billion) of world's population is adolescent.^{1,2} This is a vulnerable phase in life which represents a transition from childhood to physical, psychological and social maturity.³ Early exposure to some health-related factors during this period may contribute to the development of many Non-Communicable Diseases (NCD) later in life, such as Cardiovascular Diseases (CVD) diabetes and cancer.⁴ About 70% of the premature deaths among adults are mainly caused by behaviors that began in adolescence (4). It has been shown that early establishment of health promotion measures improves the quality of life and have an impact on the reduction of morbidity and mortality. For this reason, adolescence is considered as an important target for achieving the 35 child-related SDG indicators identified by UNICEF.^{5,6}

However, this group is difficult-to-measure, and hard-to-reach and the needs of adolescent girls in particular are often ignored especially in Low-and Middle-Income Countries (LMICs).¹ The regions of South Asia, East Asia and the Pacific constitute the largest proportion of adolescents in the world (650 million).⁷ Overall health status in these age group in this region is largely unknown. The aim of the study was to identify health issues associated with adolescence and address the overall health needs among school going urban adolescent girls of Chattogram, Bangladesh.

MATERIALS AND METHODS

This was a cross sectional study performed during the year 2018 in a government girls' high school at authors' metropolitan city which is the second largest city of the country. This school is a pioneer institute for girls' education in the city and usually the best performing students can get admission there.

After training of the data collectors and piloting, a questionnaire and a consent form were given to each of the students and they were asked to return those with a photo and permission from the parents. Some demographic and socioeconomic data were filled up by the parents on behalf of their child. Data collection was performed between 31st March and 17th April, 2018 for morning shift students and between 1st September and 6th September, 2018 for day shift students. Students in whom disease conditions were identified by the junior doctors, were re-examined on the last day by a panel of specialist comprising a paediatric surgeon, a gynaecologist, a paediatrician, a public health expert, and an eye specialist (All above the rank of associate professor or equivalent rank).

Data regarding demographic, socioeconomic, health related behaviour and problems were collected. Age, religion, occupation of parent/guardian, total monthly income of the family, source and treatment of drinking water, immunization and deworming status were recorded. The students were asked to report any present complaints and presence of any congenital anomalies. Anthropometric measurements, general and systemic examinations were performed. Height and weight were measured to calculate BMI. To address measuring bias, multiple measurements were taken and the most consistent data were recorded. Same brand of equipment was used for the measurements. Blood grouping and Rh typing was performed in 476 students, in 760 students blood group was known from previous tests and in 79 students blood grouping was not performed and could not be known. No other invasive investigations or procedures were performed. Nutritional status was defined based on BMI: underweight (BMI <18.5), normal weight (BMI 18.5 to 25), overweight (BMI 25-30), and obese (BMI >30).

Compiled data were coded in unique alphanumeric codes for each variable and subjected to statistical analysis using Microsoft Excel 2019 and SPSS version 22. Categorical variables were described as frequency and percentage and compared using Chi-square test. Continuous variables were expressed as mean \pm standard deviation, median and Inter quartile range (IQR) and correlation was analysed using Pearson correlation test. Trend lines were analysed for deworming, malnutrition and major physical problems among students of lower to higher classes and R-squared values were calculated using linear regression model. p value < 0.05 was considered to be significant. This study guaranteed the confidentiality of data by expressly omitting names from the case record forms and data were collected and processed in absolute anonymity with restricted user.

RESULTS

Among a total of 1315 students, age ranged from 10 to 17 years (Mean 12.53 ± 1.50 , median 13, and IQR 11-14 years). Number of students from class 5,6,7,8 and 9 were respectively 269 (20.5%), 267 (20.3%), 261 (19.8%), 251 (19.1%), 267 (20.3%). Majority were Muslim (970, 73.76%), followed by Hindu (294, 22.36%) and Buddhist (50, 3.8%). Majority of the parents were service holder (468, 35.59%), followed by businessman (366, 27.83%) and teacher (171, 13%) (Table I). Table I summarizes the socioeconomic and health related behaviours. Immunization rate was 98.17% and deworming rate was 57.41%. Frequency and percentage of deworming significantly reduced among students of higher classes ($p=0.00$).

Majority of the girls complained of problem in eyesight (583, 44.33%). Allergy to various substances (500, 38.02%) was the second most common complaint followed by headache (435, 33.08%). Menstrual problem was present in 334 (25.40%) girls. Table II lists the problems described by the students and Table III summarizes the symptoms related to these complaints. Abdominal pain was complained by 125 (9.51%), lower limb and joint pain by 50 (3.8%), back pain by 17 (1.29%), and other region by 40 (3.04%) students. Among urinary problems 72 (5.48%) had dysuria, 10 (0.76%) had itching in the genitalia, 4 (0.30%) had diagnosed urinary tract infection, 2 (0.15%) had dribbling of urine. Among bowel problems 124 (9.43%) had constipation, 15 (1.14%) had Per rectal bleeding, 17 (1.29%) had both, 8 (0.61%) had diarrhoea and one each had rectal prolapse and painless anal swelling. Only single complaint was present in 324 (24.64%) girls, 2 complaints in 329 (25.02%), 3 in 259 (19.7%), 4 in 137 (10.42%) and more than 4 complaints were present in 109 (8.29%) girls.

Ocular and menstrual problems increased in higher classes ($p=0.00$ and 0.01 , respectively). Complaint of weakness also increased in higher classes but was marginally statistically insignificant ($p=0.05$). Allergic conditions were described more by students of class 5 and 8 (0.01) while cough was complained more by students of class 6 and 8 ($p=0.00$). There was no significant difference among classes regarding pain ($p=0.67$), bowel problem ($p=0.12$), urinary problem ($p=0.96$), and sore throat ($p=0.97$).

Weight ranged from 22 to 94 kg (mean 48.26 ± 11.11 , median 47, IQR 40-55 kg). Height ranged from 34-101 cm (mean 152.52 ± 36.11 , median 152, IQR 148-156 cm). Obesity and overweight were significantly more in higher classes and underweight in lower classes, $p=0.00$ (Figure 1). There was no relation of deworming status with parent's occupation or income categories ($p=0.90$ and 0.47 , respectively). Anaemia was present in 106 (8.06%), raised temperature in 3 (0.23%) and oedema in 2 (0.15%). None had jaundice, cyanosis or clubbing. Temperature ranged from 94 to 103-degree Fahrenheit (Mean $98.63 \pm .78$ and median 98.67). Milestone of development was delayed in 8 (0.61%), equally divided between cognitive and speech delay. There were one positive examination finding in 383 (29.13%), two in 50 (3.80%), three

in 9 (0.68%), and four in 2 (0.15%) girls. Among the girls who mentioned about at least one problem (1158), 36.79% had at least one positive examination finding. Among those who did not have any complaint (157), 12.74% had positive examination finding.

Among the disease conditions, birth defects were 59 (4.5%) and the rest were acquired conditions. Table IV summarizes cranio-facial, ENT and limb conditions diagnosed from history and physical examination in these girls. Among abdominal conditions, 141 had constipation, 32 had per rectal bleeding, 3 had inguinal hernia, 1 had haemorrhoid, and 1 had rectal prolapse. Among chest conditions, 53 had cough with sputum, 49 had dry cough, 39 had bronchial asthma, and one had history of open-heart surgery. One girl had hypothyroidism and was on medication. Skin conditions other than allergy were acne (8), depigmentation (3), fungal infection (2), ugly scar (2), vitiligo (2), psoriasis (1), keratosis pilaris (1), post chicken pox keloid (1), nevus (1), mole (1) and paronychia (1).

Table I Socioeconomic and health related behaviours and parameters (n=1315)

Socio-economic parameters		Health parameters	
Parent's occupation	Frequency (%)	Blood group	Frequency (%)
• Service Holder	468 (35.6)	• O+	449 (34.1)
• Businessman	366 (27.8)	• B+	397 (30.2)
• Teacher	171 (13.0)	• A+	274 (20.8)
• Banker	84 (6.4)	• AB+	89 (6.8)
• Engineer	45 (3.4)	• O-	13 (1.0)
• Non-Resident Bangladeshi	41 (3.1)	• B-	9 (0.7)
• Doctor	36 (2.7)	• A-	4 (0.3)
• Advocate	32 (2.4)	• AB-	1 (0.1)
• Small Businessman	29 (2.2)	• Unidentified	79 (6.0)
• Defence	17 (1.3)	Immunization	
• Other	26 (2.0)	• Immunized	1291 (98.2)
Monthly family income (BDT)		• Not immunized	18
• >50000	391 (29.7)	• Unknown	6
• 40000-50000	293 (22.3)	Deworming	
• 30000-40000	254 (19.3)	• Yes	755 (57.4)
• 20000-30000	226 (17.2)	• No	557 (42.4)
• 10000-20000	104 (7.9)	• Unknown	3 (0.2)
• <10000	36 (2.7)	Nutritional status based on BMI	
• Unknown	11 (0.8)	• Normal weight	687 (52.3)
Water Source		• Underweight	405 (30.8)
• Tap water	1171 (89.1)	• Overweight	186 (14.1)
• Tube well water	133 (10.1)	• Obese	37 (2.8)
• Unknown	7 (0.5)	Presence of complaints	
• Pond water	2 (0.2)	• Yes	1158 (88.9)
• Tap Water and tube well water	2 (0.2)	• No	157 (11.9)
Water treatment		Positive examination findings	
• Boiled water	708 (53.8)	• Present	446 (33.9)
• Filtered Water	524 (39.9)	• Absent	869 (66.1)
• Boiled and filtered water	52 (4.0)		
• Direct from source	27 (2.1)		
• Unknown	4 (0.3)		

Table II List of physical problems described by the students (n=1315)

Symptoms	Frequency (%)
Ocular problems	583 (44.3)
Allergy	480 (36.5)
Headache	435 (33.1)
Menstrual problems	334 (25.4)
Pain	230 (17.5)
Cough	190 (14.5)
Bowel problems	168 (12.8)
Weakness	142 (10.8)
Urinary problem	93 (7.1)
Vaginal discharge	75 (5.7)
Sore throat	87 (6.6)
Fever	34 (2.6)
Skin lesion	18 91.4
Nasal congestion	14 (1.1)
Other	63 (4.8)

Table III Types of eye-related, allergic and menstrual problems (n=1315)

Problems	Frequency (%)
Types of eye-related problem	
• Difficult seeing blackboard writing (Undiagnosed)	293 (22.3)
• Myopia (Use glasses)	256 (19.5)
• Squint	16 (1.2)
• Hypermetropia	12 (1.0)
• Excessive Tear Secretion	10 (0.8)
• Conjunctivitis	4 (0.3)
• Itching	4 (0.3)
• Blurring of Vision	4 (0.3)
• Other (one each of chalazion, dropping, photophobia, sclera pigmentation, swelling, asymmetric position, or a combination of above)	8 (0.6)
Types of allergies	
• Food	260 (19.8)
• Allergic skin conditions	106 (8.1)
• Dust	66 (5.0)
• Cold	12 (1.0)
• Insect	9 (0.7)
• Perfume	2 (0.2)
• Drug	2 (0.2)
• Animal	1 (0.1)
• Flower	1 (0.1)
• Combination of above	19 (1.4)
Problems with menstruation	
• Dysmenorrhoea	131 (10.0)
• Irregular cycle	103 (7.8)
• Menorrhagia	25 (1.9)
• Oligomenorrhoea	21 (1.6)
• Poly menorrhoea	12 (0.9)
• Long cycle	9 (0.7)
• Not started yet (delayed)	3 (0.2)
• Combination of above	8 (0.6)

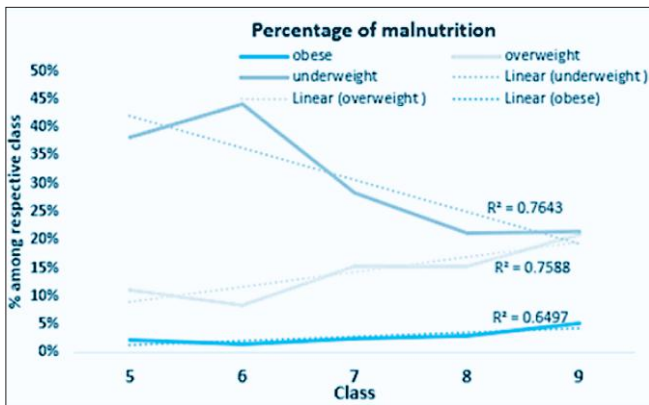


Figure 1 Percentage of malnutrition among students of class 5 to class 9 (n=1315)

Table IV List of cranio-facial, ENT, and limb conditions (n=1315)

Cranio-facial	No	ENT	No	Limb	No
Tongue Tie	4 (0.3)	Chronic tonsillitis	67 (5.1)	Hyperhidrosis on Palm	2 (0.2)
dental caries	2 (0.2)	Acute tonsillitis	7 (0.5)	Phocomelia of right upper limb	1 (0.1)
Malocclusion of Jaws	1 (0.1)	Allergic rhinitis	39 (3.0)	Hemiparesis of left forearm	1 (0.1)
Submandibular tenderness	1 (0.1)	Chronic sinusitis	7 (0.5)	Rough palmar Skin	1 (0.1)
Raised Nasal Bridge after corrected cleft lip and palate.	1 (0.1)	Hearing difficulty	4 (0.3)	Swelling of middle finger (Right Hand) [Amputated at the age of 1.5 years]	1 (0.1)
Facial Palsy	1 (0.1)	Nasal Polyp	3 (0.2)	Polydactyly in both hands	1 (0.1)
Tongue Pigmentation	1 (0.1)	CSOM	3 (0.2)	Dermatomyositis	1 (0.1)
Flat facies	1 (0.1)	DNS	2 (0.2)	Bony deformity of lower limb	1 (0.1)
Asymmetry of Face (Mandible)	1 (0.1)	Atrophic Rhinitis	1 (0.1)	Defect in 4 th and 5 th toes of right foot	1 (0.1)
Crouzon Syndrome	1 (0.1)	Hypertrophied	1 (0.1)	Swelling of right index finger	1 (0.1)
Occipital lipoma	1 (0.1)	Inferior Turbinate			
		Adenoid	1 (0.1)	Eversion of left foot	1 (0.1)
		Branchial Fistula in Left Side of Neck	1 (0.1)	Slightly inverted right foot	1 (0.1)
		Deafness	1 (0.1)	Flat foot	1 (0.1)
		Recurrent abscess around The Ear	1 (0.1)	Thigh Muscle Defect	1 (0.1)
		Tinnitus	1 (0.1)	Hypertrophic Scar over Right Hand	1 (0.1)
		Bat Ear	1 (0.1)	Ganglion	1 (0.1)
		External Ear Deformity	1 (0.1)	Axillary lipoma	1 (0.1)
		Macrotia	1 (0.1)	Tuberculosis of knee joint	1 (0.1)

DISCUSSION

This study, conducted among the students of class five to nine in a girls’ high school in Chattogram, shows that there is a large burden of health-related problems among them. About 89% of the girls had some presenting complaints and one third of the girls had positive examination findings. Malnutrition, ocular health, headache and menstrual problems are major areas of concern.

About 89% of the family had a monthly income of more than 20,000 BDT in this study. The average household income in Bangladesh was about 16,000 BDT in 2016.⁸ Almost all students used safe drinking water and about 98% used additional water treatment before drinking. Major source of drinking water was tap water. About 54% boiled water and about 40% filtered water before drinking. This urban scenario is in contrast with the census report of 2011 which showed that about 89% of the population of the country used tube-well water. Although, immunization status was well (98.17%), about 57% of the students took anthelmintic drug within the last three months. This was amidst a school deworming program in that school few days earlier. Students reported that some of them were absent on that day and others did not like the medicine and dropped it. This low deworming rate was contrary to findings from rural primary schools and a survey from DGHS which found a higher rate of deworming among primary school students.⁹⁻¹¹ Deworming rate in these studies ranged from 81% to 99%. A study that explored the reasons behind a low coverage of mass drug administration found that about 33% students were absent on that day, 8% had fear of side effects, 7% forgot to consume the drug, 2% had lack of awareness and there was improper counselling in 7% students.¹² Another study showed that there was lack of concern about parasitic infection among children’s parents in the rural settings also.¹³ Malnutrition was prevalent and about 48% of the students suffered from malnutrition. About 31% of the girls were underweight which is similar to the findings from Bangladesh demographic and health survey 2014, which found that up to 31% of adolescent girls (15–19 years old) are undernourished (BMI<18.5).¹⁴ Underweight in adolescents has been found to be associated with adverse health consequences throughout the life. Although obesity was only about 3%, the proportion was more among students of higher classes. This is consistent with the report that prevalence of overweight and obese children and adolescent in high income countries are two times the prevalence reported for LMICS in the Asia Pacific region while the prevalence of underweight is high in LMICS (3). Obesity rates in the world’s children and adolescents increased from less than 1% (Five million girls) in 1975 to nearly 6% in girls (50 million) in 2016.¹⁵ A meta-analysis reported that adolescents’ overweight and obesity have emerged as a major public health threat in Bangladesh and the pooled prevalence rates of overweight and obesity were 7% and 6%, respectively.¹⁶ In a cross-sectional study conducted among 854 school children (Aged 12-18 years) in Bangladesh found that both urban and rural school children had poor CVD risk factor profile. Only 3.1% of urban students consumed recommended fruits and physical inactivity, overweight and obesity had higher odds.¹⁷ Knowledge about essential nutrition among school-going adolescents was also quite low and approximately half of the participants from another recent study scored low in basic nutrition knowledge assessment.¹⁸ A case-control study conducted among students aged 10-16 years in Bangladesh

found that family income >50,000 BDT per month, no physical activity, more than 4 h of sedentary activities, regular consumption of fast food were risk factors associated with childhood overweight/obesity whereas, having a normal weight mother and eating cakes or biscuits less than 3 days a week were found as protective factors.¹⁹ It has been suggested that there is an urgent need to invest in improving the diets of adolescents in Bangladesh.²⁰

Ocular problems were prevalent among a large number of students who represent the better performing students of the city. Although a community-based peri-urban study found a prevalence rate of 5.63% among children less than 15 years, the frequency was much higher in this study.²¹ About 19% of the girls were using spectacles and there were more who had undiagnosed vision problems. Visual impairments are associated with health, educational attainment, and social functioning throughout the life.²² A population based epidemiological study among adults in Dhaka reported that about 93% of the participant selected through multi-stage cluster sampling were clinically diagnosed with eye disease and female gender was one of the significant associations with refractive error.²³

Menstrual problems had been experienced by about one fourth of the girls in this study and majority had dysmenorrhoea and irregular cycles. Poor menstrual hygiene and inadequate self-care are major determinants of morbidity and other complications among them. Studies have shown that most adolescent girls had incomplete and inaccurate information about menstrual physiology and its management.²³⁻²⁵ Adolescent girls are often reluctant to discuss this topic with their parents and hesitant to seek help regarding their menstrual problems.²⁶ A nationwide cross-sectional study conducted among 2332 school girls aged 11-17 years from 700 schools found that they had a mean 2.8 missed days per menstrual cycle. Girl's attitude, misconceptions about menstruation, insufficient and inadequate facilities at school, and family restriction were some of the risk factors for school absence.²⁷ A study reported that in Bangladesh adolescents' need of sexual and reproductive health information and services was not addressed so far according to their expectation. Maintenance of confidentiality was the main concern for them and they opined that school health clinics could be a good option for maintaining their privacy.²⁸ Another study on older adolescent girls (16-17 years) reported that 65% of the girls thought school's text books lack sufficient knowledge and 61% though school teaching system was insufficient concerning sexual and reproductive health.²³ An ideal menstrual health education curriculum would encourage girls to think about the relationships between knowledge, choice, behaviours and enhanced human health and would help to improve maternal health.²⁹ Another school-based educational intervention study on menstrual health conducted among 416 adolescent girls aged 11-16 years found that it had significantly improved knowledge (51% to 82.4%), beliefs and practices (28.8% to

88.9%) among them. It also reduced complications from lack of hygiene.³⁰ Schools are optimistic in addressing the issues surrounding menstrual hygiene, however, lack of resources, unavailability of fund for the maintenance of facilities, affordability of sanitary napkins and poverty are some of the obstacles to establish and maintain menstrual hygiene facilities in the schools.

LIMITATIONS

This study has several limitations. Health related data were taken primarily based on history given by the girls and clinical examination; Hence misclassification bias maybe present in some cases. Recall bias and low response could be present as data collection was conducted mainly by face-to-face interview. Measurement bias due to human error could also exist. The study is furthermore subjected to all the limitations of a cross-sectional study. Nonetheless, this study has highlighted some major areas of concern among adolescent school girls in a part of Bangladesh and will add to the growing evidence for the need for action to improve the situation.

CONCLUSION

There are a lot of health-related problems among adolescent school girls which needs to be addressed. Malnutrition, ocular problems, menstrual problems and headaches are major areas of concerns. Menstrual and ocular problems increased with age. Majority use safe drinking water and are well immunized, however, deworming status is not satisfactory. Obesity and overweight were more among senior students and underweight in junior students.

RECOMMENDATIONS

- Lifestyle modification and nutritional improvement.
- Further studied on the role of electronic devices on visual problems in school children and limiting their use.
- Awareness creation about deworming among older kids and their parents.

DISCLOSURE

All the authors declared no competing interest.

REFERENCES

1. Kotecha P V, Patel S V, Mazumdar VS, Baxi RK, Misra S, Diwanji M, et al. Reproductive health awareness among urban school going adolescents in Vadodara city. *Indian J Psychiatry*. 2012;54(4):344–348.
2. UNICEF. Adolescents overview [Internet]. 2019 [cited 2020 Dec 7]. Available from: <https://data.unicef.org/topic/adolescents/overview/#:~:text=Adolescents – defined by the United, the Rights of the Child>.
3. OECD/WHO. Health at a Glance: Asia/Pacific 2020: Measuring Progress Towards Universal Health Coverage. Paris: OECD Publishing. 2020.
4. Malta DC, de Andreazzi MAR, Oliveira-Campos M, Al. E. Trend of the risk and protective factors of chronic diseases in adolescents , National Adolescent School-based Health Survey (PeNSE 2009 e 2012). *REV BRAS EPIDEMIOL*. 2014;Suppl PeNS:77–91.
5. UNICEF. The State of the World’s Children 2011: Adolescence An Age of Opportunity [Internet]. New York: UNICEF. 2011. Available from: <https://www.unicef.org/reports/state-worlds-children-2011>
6. UNICEF. UNICEF BRIEFING NOTE SERIES ON SDG global indicators related to children [Internet]. New York. 2018. Available from: <https://data.unicef.org/wp-content/uploads/2018/05/SDG-Briefing-Notes-web.pdf>.
7. UNICEF. For every child , reimagineFor Every Child, Reimagine. UNICEF Annual Report 2019. New York: United Nations Children’s Fund (UNICEF). 2020.
8. CEIC. Bangladesh HIES: Household Income per Month [Internet]. 2016 [Cited 2020 Dec 7]. Available from: <https://www.ceicdata.com/en/bangladesh/household-income-and-expenditure-survey-average-monthly-income-per-household-by-income-group/hies-household-income-per-month#:~:text=Bangladesh’s HIES%3A Household Income per Month data is updated yearly,of 4%2C366.000 BDT in 1996>.
9. Afroz S, Debsarma S, Dutta S, Rhaman MM, Mohsena M. Prevalence of helminthic infestations among Bangladeshi rural children and its trend since mid-seventies. *IMC J Med Sci*. 2019;13(1):004.
10. Farooq MA Al, ;Haq MN, Tajreen T, Sajid MM, Chowdhury TK. Health and Disease among Primary School Children : A Snapshot from Rural Bangladesh. *IJTDH*. 2020;41(12):52–62.
11. DGHS. Health Bulletin [Internet]. 2018. Available from: <https://dghs.gov.bd/images/docs/Publicaations/HB 2018 final.pdf>.
12. Faizah, Farah, Murhandarwati, EH, Prabandari, YS, Ahmed, Be-Nazir, HossianMM, Mazumder H. Feasibility of school-based health intervention for compliance of mass drug administration for soil transmitted helminthiasis in Bangladesh. Preprint [Internet]. 2020;1–20. Available from: https://advance.sagepub.com/articles/preprint/Feasibility_of_school-based_health_intervention_for_compliance_of_mass_drug_administration_for_soil_transmitted_helminthiasis_in_Bangladesh/11788941/1.
13. Sujun, Md. Safaet Hossain, Islam, Md. Saiful; Naher, Shabnam; Banik, Rajon; Gozal D. Predictors Associated With Knowledge and Practice of Helminthic Infection Prevention Among Rural School-Aged Children ’ s Parents in Bangladesh : A Cross-Sectional Study. *Front Public Heal*. 2020;8:484.
14. National Institute of Population Research and Training, Mitra and Associates & II. Bangladesh demographic and health survey 2014 [Internet]. Dhaka; 2015. Available from: <https://dhsprogram.com/pubs/pdf/FR311/FR311.pdf>.
15. Bucher K, Dooley T, Little C, Gonzalez C, Sethna Z, Tamagni J, et al. Progress for children beyond averages: Learning from the MDGs. New York: UNICEF. 2015.
16. Biswas T, Islam A, Islam S, Pervin S, Rawal LB. Overweight and obesity among children and adolescents in Bangladesh : A systematic review and meta-analysis. *Public Health [Internet]*. 2016;142:94–101. Available from: <http://dx.doi.org/10.1016/j.puhe.2016.10.010>.
17. Islam TMM, Banik PC, Barua L, Mohammed S, Islam S, Chowdhury S, et al. Cardiovascular disease risk factors among school children of Bangladesh : A cross- - sectional study. *BMJ Open*. 2020;10(e038077).
18. Kundu S, Bakchi J, Sayeed A. Sources of nutrition information and nutritional knowledge among school-going adolescents in Bangladesh. *Public Heal Pract*. 2020;1:100030.
19. Alam, Mohammad Morshed, Hawlader, M D H, Wahab, A, Hossain M D; Nishat, A A, Zaman, S, Ahsan G. Determinants of overweight and obesity among urban school-going children and adolescents : A case-control study in Bangladesh Abstract : *Int J Adolesc andHealth*. 2019;20180034.
20. Leroy JL, Ruel M, Sununtnasuk C, Ahmed A. Understanding the determinants of adolescent nutrition in Bangladesh. *Ann NY Acad Sci*. 2018;1416:18–30.
21. Hussain AHME, Roy T, Ferdousi N, Sen U. Prevalence of childhood ocular morbidity in a peri- urban setting in Bangladesh : a community-based study. *Public Health [Internet]*. 2019;170:103–112. Available from: <https://doi.org/10.1016/j.puhe.2019.02.026>.
22. Davidson S, Quinn GE. The Impact of Pediatric Vision Disorders in Adulthood. *Pediatrics*. 2010;127(2):334–339.
23. Hennegan J, Sol L. Confidence to manage menstruation at home and at school : Findings from a cross-sectional survey of schoolgirls in rural Bangladesh. *Cult Health Sex [Internet]*. 2019;online:1–20. Available from: <https://doi.org/10.1080/13691058.2019.1580768>.

REFERENCES

24. Chandra-mouli V, Patel SV. Mapping the knowledge and understanding of menarche , menstrual hygiene and menstrual health among adolescent girls in low- and middle-income countries. *Reprod Health*. 2017;14(30):1–16.
25. Muhit IB, Chowdhury ST. Menstrual Hygiene Condition Of Adolescent Schoolgirls At Chittagong Division In Bangladesh. *IJSTR*. 2013;2(6):58–62.
26. Kabor, Babar, Barua, Milon Kanti, Ahmed M. Improving menstrual hygiene facilities in secondary schools Initiatives from BRAC-WASH Program [Internet]. Dhaka. 2012. Available from: <https://www.ircwash.org/sites/default/files/Kabir-2012-Improving.pdf>
27. Alam M, Luby SP, Halder AK, Islam K, Opel A, Shoab AK, et al. Menstrual hygiene management among Bangladeshi adolescent schoolgirls and risk factors affecting school absence : Results from a cross-sectional survey. *BMJ Open*. 2017;7:e015508.
28. Yunus, Samiha, Sharmin, Sabrina;Huq, Nafisa Lira, Haseem, Fariha, Imam, Md. Ali, Nahar Q. Expectations of adolescents to receive reproductive health information and services from health service system: A qualitative study in Bangladsh. *South East Asia J Public Heal*. 2017;7(2):19–26.
29. TEN VTA. Menstrual hygiene: a neglected condition for the achievement of several Millennium Development Goals. Zoetermeer: Europe External Policy Advisors (EEPA). 2007.
30. Haque SE, Rahman M, Itsuko K, Mutahara M, Sakisaka K. The effect of a school-based educational intervention on menstrual health : An intervention study among adolescent girls in Bangladesh. *BMJ Open*. 2014;4:e004607.