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Editorial   *Open Access*

Necessity of Drug Audit at Outpatient Department of Tertiary Care Hospital: Bangladesh Perspective

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Medicines play an important role in disease prevention and management[1-2]. Availability and correct use of medicines are very crucial aspect of patient care[3].A review of a large number of prescribing quality indicators has been proposed and many are used routinely in quality management. Often the content and face validity of indicators have been assessed by consensus methods.

Prescription data are frequently used for indicators, but they do not provide any direct information about disease and patient factors important for judging the quality of prescribing. The concurrent validity of indicators should be assessed by comparing them to a gold standard quality assessment at the patient level using all available clinical information. In the future, detailed clinical information from practice databases and computerized hospital records will be an important data source for indicators and for validation studies.

Efficient and effective health care system truly depends on the rational prescription of drugs by a licensed medical practitioner and proper dispensing and distribution of that prescribed drug[1,2]. Rational use and thus rational prescribing of drugs requires that "patients receive medicines appropriate to their clinical needs in doses that meet their own individual requirements, for an adequate period of time and at the lowest cost to them and their community"[4].

Global morbidity and mortality can be reduced by using appropriate and rational using of safe medicines[5].An appropriate prescription has the remarkable influence on drug therapy and patient health[2]. However, irrational and inappropriate use of drugs is a global problem, resulting in different health threats such as increased incidences like drug-drug interactions, adverse side effects, and antibiotic resistance.

Why do we need prescribing quality evaluation? In spite of all measures developed at various stages like local, state, national and international level, the situation still needs improvement and as reviewed previously inappropriate or irrational prescribing is widespread all over the world. This was to improve the situation further stringent continuous efforts will be required. Several tools have been developed

and introduced from time to time for this purpose. They ranged from simple tools (WHO core prescribing indicators) to complex tools (Beer's criteria, explicit criteria, medication appropriateness index).

Prescription order is an important transaction between the physician and the patient. It is an order for a scientific medication for a person at a particular time. It brings into focus the diagnostic acumen and therapeutic proficiency of the physician with instructions for palliation or restoration of the patient's health. Prescription is a written document that engages the medical and legal responsibility not only of the physician but of all those subsequently involved in its execution. Unfortunately, times have changed. More often than not we find incomplete and illegal prescriptions being handed over to patient and has resulted in a disturbing trend of putting the patients' safety at risk; and there is an urgent need to put things right.

According to the WHO, more than 50.0% of all patients fail to take their prescribed or dispensed medicines appropriately, and half of all medicines are improperly prescribed, dispensed, and sold[4,6]. Inappropriate prescribing practices are more prevalent in developing countries due to lack of regulation, guidelines, proper training, and monitoring. The lack of adequate therapeutic training, drug knowledge and experience of physicians, improper guidelines, patient's inadequate or no communication with physicians, self medication, and polypharmacy increase irrational use of drug[2].

Irrational and excessive prescribing causes unwanted clinical results like unsafe treatment, prolong illness or slow recovery, elevation of the risk of toxicities, and enhancement of adverse drug reaction and increases antibiotic resistance[8-9].Inappropriate and incorrect use of medicines in elder and pediatric patients associated with many problems and adverse drug reactions[10].

Common types of irrational medicine use are: the use of more than two medicines per patient (polypharmacy), inappropriate use of antimicrobials, often in inadequate dosage, for non-bacterial infections, over-use of injections when oral formulations are available antimicrobial drug resistance is a worldwide concern for public health in both developed and developing countries. Most antibiotics are prescribed empirically; there is no or little culture sensitivity test before antibiotic prescribing[11]. Indeveloping countries like Bangladesh, 55.6% antibiotics are prescribed for

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suspected case, 33.5% are for the confirmed case, 40.2% are prescribed in cold and fever without diagnostic test, and 37.3% are prescribed for pleasing the patients[12]. Prescription errors also cause health care less or ineffective and nearly four errors per prescription were found in a survey that was conducted at a tertiary hospital in Bangladesh[13].

Thus, medical audit is a systematic approach to peer review of medical care in order to identify opportunities for improvements and provide a mechanism for realizing them. Prescription audit is a quality improvement process that seeks to improve patient care. It supports health professionals in making sure their patients receive the best possible care[14]. An audit is defined as "the review and the evaluation of the health-care procedures and documentation to compare the quality of care which is provided, with the accepted standards[14].

Potential benefits of prescription audit; identify and promote good practice, improve professional practice and quality standards, supports learning and development of staff and organizations, identify and eliminate poor or deficient practice, identify and eliminate waste, promote working with multidisciplinary teams, allocate resources (financial, human) to provide better patient care and develop opportunities to present findings with relevant faculty and facilitate shared learning. Prescription audit is an active process that checks for improvement in quality of health care[15]. Prescription audit involves examining prescriptions and comparing with internationally accepted criteria given by the World Health Organization (WHO) as a guide for good prescription writing[16].

Prescription audit should be carried out at regular intervals for quality improvement of any hospital. Irrational prescription leads to different serious health problems. Physicians prescribed medicine rationally in some cases but need to ensure rationality in all prescriptions.Continuous monitoring of drug use, development of prescribing guidelines, and training are recommended to ensure and implement good-quality prescribing practices for promoting the rational and cost-effective use of drugs.

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Assessment of *Aegle marmelos* Fruit Pulp as Lipid Lowering Agent in Type 2 Diabetic Adults

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Abstract

Background: In the prevention and treatment of type 2 diabetes mellitus, plant materials are thought to be appealing potential sources of alternative medicines (T2DM). Different parts of *Aegle marmelos* (Bael) have been stated to possess anti-hyperlipidemic property. **Objective:** The aim of this study was to evaluate the lipid-lowering effects of A. marmelos unripe fruit pulp in T2DM adults of our country. **Methodology:** This un-blinded clinical trial with was conducted in the Department of Biochemistry at Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine and Metabolic Disorders (BIRDEM), Dhaka, Bangladesh from July 2010 to June 2011. The experiment was done under a crossover design and the effects were analyzed during the 0 to 21 as well as 28 to 49 days with 7 days wash out period. The data were pooled and the baseline versus endpoint values were compared. **Results:** The mean non-esterified fatty acid (NEFA) values significantly differ between the two groups at any time points. In correlation, serum NEFA level of both non-intervention and intervention group decreased significantly where P value was 0.005 and 0.001 respectively from base line to end point. **Conclusion:** The study revealed lipid-lowering effect of A. marmelos fruit pulp in T2DM patients. *[Journal of Army Medical College Jashore, January, 2024;5(1):3-6]*

Keywords: T2DM; *Aegle marmelos*; TAG; Cholesterol; NEFA

Introduction

Diabetes mellitus (DM) could be a common endocrine and metabolic disarranges influencing expansive number of individuals all over the world. It is broadly recognized as one of the major causes of death and disability worldwide[1-2]. Estimated whole diabetic patients in Bangladesh were more than three million in 2000 and this number would hit to11.1 million by the year 2030[3].

Expectedly, Type1 Diabetes Mellitus (T1DM) is treated with exogenous insulin and T2DM with oral hypoglycemic agents like sulphonylureas and biguanides[4]. A significant number of T2DM requires insulin too. However, limitations of these therapeutic agents in the management of this complex disorder lead us to search for alternate agents. Though many plants had reputations in the treatment of diabetes, scientific studies with these materials are limited. Among traditional medicinal plants, various parts of the plant, *Aegle marmelos*s, are used for the treatment of a variety of disorders. More than 100 compounds have been isolated after doing extensive chemical investigation on various parts of the tree. Marmelosin, luvangetin, aurapten, psoralen, marmelide and tannin: these bioactive compounds were isolated from these fruits[5].

Kamalakkanan and Prince[6] found this fruit extract (125 and 250mg/kg, orally twice daily for 30 days) showing antidiabetic, antihyperlipidemic and antioxidant activity in STZ diabetic rats along with partial repair of damaged pancreatic islets. The fruit extract at a dose of 250 mg/kg exhibited to be more effective[7]. Although a number of studies[6-8] in STZ and alloxan induced diabetic rat model

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were conducted with *Aegle marmelos*, but no study had yet been done on human with T2DM. In the above context, the present study was undertaken to evaluate the anti-hyperlipidemic effects of *Aegle marmelos* unripe fruit pulp powder in patients with T2DM.

Methodology

Study Place and Population: This un-blinded clinical trial with cross-over design was conducted in Bangladesh Institute of Research and Rehabilitation in Diabetes, Endocrine and Metabolic Disorders (BIRDEM), Dhaka, Bangladesh from July 2010 to June 2011. Previously diagnosed thirty T2DM cases were included in the study. T2DM cases were enrolled from the out-patient department of BIRDEM in accordance with inclusion criteria. All the required information of the participants was recorded in a pre-designed questionnaire after taking proper consent. They were advised to take their usual diet, to do normal physical activities and to continue their prescribed drugs during the experimental period.

Preparation of *Aegle marmelos* fruit pulp powder: Unripe fruits of *Aegle marmelos* were collected from a specific area of Chapainawabgonj district. Fruit pulps of *Aegle marmelos* (FPAM) were dried in sunlight for 5 to 6 days, coarsely powdered by grinder machine and stored in a dry cool place.

Study Procedure: The fasting blood samples of all the study participants were collected at day zero for estimation of triacylglycerol (TAG), cholesterol (C) and non-esterified fatty acid (NEFA). They were then divided randomly into intervention and non-intervention groups each consisting of 15 cases. First, intervention group was given 7 gm of *Aegle marmelos* fruit pulp powder in one glass of water daily before breakfast for 21 days while non-intervention group was on their usual diet for 21 days. The dose of 7 gm fruit pulp powder was determined based on earlier study6. The fasting blood samples of both groups were collected on 21st day. After 7 days of wash out period, the fasting blood samples were again collected on the 28th day from both the groups. The groups were then crossed over and the cases who consumed *Aegle marmelos* pulp drink in the first 21 days started their usual diet and the other cases started to consume the *Aegle marmelos* pulp drink for the next 21 days. The final fasting blood sampling was collected on 49th day from both the groups. All blood samples were preserved at -200 C until doing the analysis.

Biochemical Tests: Serum triglyceride was measured by enzymatic-colorimetric (GPO-PAP) method (Randox Laboratories Ltd., UK). Serum total cholesterol was measured by enzymatic colorimetric (Cholesterol Oxidase/ Peroxidase) method (Randox Laboratories Ltd., UK). Serum NEFA was estimated by colorimertic method using kits (Randox Laboratories Ltd., UK) (Matsubara C, Neshikawa Y, Y Serum creatinine was measured by alkaline-picrate method (Randox Laboratories, UK).

Statistical Analysis: Statistical analysis was performed using SPSS (Statistical Package for Social Science) software for Windows version-16 (SPSS Inc., Chicago, Illinois, USA). The data were expressed as proportion and mean±SD (standard deviation) as appropriate. The statistical significance of differences between the values was assessed by paired or unpaired student's t test as appropriate. Correlation analysis between the parameters was done by using Pearson's Correlation test. A two-tailed p value of less than 0.05 was considered statistically significant.

Results

In this study, the lipidemic status of T2DM cases after 21 days of daily drink of *Aegle marmelos* fruit pulp was compared to those who did not receive the intervention (Table 1).

Table 1: Effect of *Aegle marmelos* Fruit Pulp Powder on Lipidemic Status of T2DM Subjects During 0-21 days (n=15 in each group)

Parameters	Day 0	Day 21	P value
Triglyceride (mg/dL)			
● Non-intervention Group	141 ± 60.53	158 ± 97.5	0.16
● Intervention Group	141 ± 60.5	149 ± 63.5	0.41
● t/p value	0.57/0.58	-0.31/0.76	
Serum Cholesterole (mg/dL)			
● Non-intervention Group	199 ± 87	198 ± 46	0.93
● Intervention Group	181 ± 39	141 ± 30	0.28
● t/p value	-0.73/0.47	-1.84/0.08	
Serum NEFA (mmol/L)			
● Non-intervention Group	0.81 ± 0.24	0.63 ± 0.24	0.005*
● Intervention Group	0.87 ± 0.36	0.70 ± 0.33	0.02*
● t/p value	0.52/0.61	0.62/0.54	

Values were expressed as Mean± SD. P<0.05 was considered as statistically significant, n= number of subjects; Inerevention group=*Aegle marmelos* treated group; NEFA= non-esterified fatty acids.

The effects of *Aegle marmelos* fruit pulp powder on lipidemic status of T2DM cases after cross over and 7 days of wash period. Only NEFA showed a significant difference between the intervention and non-intervention groups at 21 days of taking *Aegle marmelos* drink as well as at day 49. There was no significant change of serum triacylglycerol and cholesterol levels of all cases (Group A and B) at base point (day zero) versus end point (day 49). Comparison between 0 day 21 day values of the same individual were compared by Paired- t test (n=30). On the other hand, comparison between Control and FPAM Groups on 0 day and 21 days were done by unpaired t-test (n=15) (Table 2).

Table 2: Effect of *Aegle marmelos* Fruit Pulp Powder on Lipidemic Status of T2DM Subjects during 28 to 49 days (n=15 in each group)

Parameters	28 day	49 day	P value
Triglyceride (mg/dL)			
● Non-intervention Group	174 ± 99	155 ± 79	0.33
● Intervention Group	131 ± 50	130 ± 60	0.87
● t/p value	1.51/0.15	0.98/0.34	
Serum Cholesterole (mg/dL)			
● Non-intervention Group	176 ± 26	177 ± 30	0.92
● Intervention Group	189 ± 47	201 ± 87	0.58
● t/p value	-0.97/0.34	-1.03/0.32	
Serum NEFA (mmol/L)			
● Non-intervention Group	0.78 ± 0.28	0.78 ± 0.24	0.97
● Intervention Group	0.56 ± 0.22	0.44 ± 0.21	0.02*
● t/p value	2.4/0.02	4.1/<0.001	

Values were expressed as Mean± SD. P<0.05 was considered as statistically significant, n= number of subjects; Intervention group=*Aegle marmelos* treated group. S NEFA= Serum Non Esterified Fatty Acid.

The lipidemic status of T2DM subjects was shown comparing between base point and end point. Only serum NEFA level of both Control and FPAM group decreased significantly where P value was 0.005 and 0.001 respectively from base line to end point. At base line non-intervention group was 0.81 ± 0.24 and intervention group was 0.72 ± 0.33; while at end point non-intervention group was 0.64 ± 0.25 and intervention group was 0.57 ± 0.30. Comparison between 28 days 49 day values of the same individual were compared by Paired- t test (n=30).

Table: 3 Effects of *Aegle marmelos* Fruit Pulp Powder on Lipidemic Status of T2DM subjects (Base line Vs. End point) (n=30 in each group)

Parameters	Base line	End Point	t/p value
Triglyceride (mg/dL)			
● Non-intervention Group	128 ± 61	158 ± 97	1.0/0.16
● Intervention Group	136 ± 55	139 ± 61	-0.46/0.64
● t/p value	-0.83/0.41	-0.88/-.38	
Serum Cholesterole (mg/dL)			
● Non-intervention Group	199 ± 87	198 ± 46	-0.09/0.93
● Intervention Group	185 ± 43	186 ± 66	-0.09/0.93
● t/p value	-0.16/0.87	-0.06/0.95	
Serum NEFA (mmol/L)			
● Non-intervention Group	0.81 ± 0.24	0.64 ± 0.25	-
● Intervention Group	0.72 ± 0.33	0.57 ± 0.30	0.04/0.005*
● t/p value	-1.1/0.28	-1.9/0.05	3.7/0.001*

Values were expressed as Mean± SD. P<0.05 was considered as statistically significant, n= number of subjects; S NEFA= Serum Non Esterified Fatty Acid

On the other hand, comparison between non-intervention and intervention groups on 28 days and 49 days were done by unpaired t-test (n=15). Comparison between 0 day 21 day values of the same individual were compared by Paired- t test (n=30). On the other hand, comparison between non-intervention and intervention Groups on 0 day and 21 days were done by unpaired t-test (n=30) (Table 3).

Discussion

A number of parts of *Aegle marmelos* have been studied for the anti-diabetic properties in diabetic rat models. The present one was probably the first study in which a part of the plant was tested on human for exploring anti-hyperlipidemic properties in presence of T2DM. The part chosen was the unripe fruit pulp of *Aegle marmelos* as this was the commonest part consumed by people as drink and prescribed by the traditional healers in Bangladesh. In fact, a few commercial preparations of the pulp are now available in Bangladesh market with wide spectrum of therapeutic claims including for diabetes. Testing the efficacy and safety of the fruit pulp has thus public health importance.

The present study was conducted under a crossover design and the effects were analyzed for 0 to 21 as well as 28 to 49 days (with 7 days wash out period) intervention. The data were then pooled and the baseline versus endpoint values was also compared. The effect on free fatty acid (NEFA) was significant in both of the analysis.

In type 2 DM, insulin resistance associated with obesity (abdominal or visceral) augments genetically determined insulin resistance[9]. Insulin resistance in fat cells results in hydrolysis of stored triglyceride, which elevates free fatty acids in the blood plasma. Insulin resistance or deficiency results in elevations of fasting and postprandial glucose and lipid levels. Free fatty acids (FFA) are stored as triglycerides in adipocytes and serve as an important energy source during conditions of fasting[7]. Insulin is a potent inhibitor of lipolysis, and restrains the release of FFA from the adipocyte by inhibiting the enzyme hormone sensitive lipase. In T2DM the ability of insulin to inhibit lipolysis as reflected by impaired suppression of radioactive palmitate turnover and reduce the plasma FFA concentration is markedly reduced[9]. It is now recognized that chronically elevated plasma FFA concentrations can lead to insulin resistance in muscle and liver[10] and impair insulin secretion[11].

This study did not show any significant effect of the plant material on basic defects in T2DM. This, however, does not mean that *Aegle marmelos* may not have these effects. The effects may be present in other parts or it may be happened that active ingredient(s) are present in fruit pulp. The potential of the plant material as an antidiabetic agent from its beneficial effect on serum NEFA which, eventually, is expected to lead to an improvement on

hyperglycemia and dislipidemia by increasing insulin secretion as well as reducing insulin resistance. Thus further conclusive studies are required in this regard.

Conclusion

In conclusion, anti-hyperlipidemic effects of different parts of *Aegle marmelos* plant is found, but the present study revealed any such anti-hyperlipidemic effect of *Aegle marmelos* unripe fruit pulp in T2DM patients. However, the results do not confirm conclusively that *Aegle marmelos* fruit pulp have anti-hyperlipidemic property as we could not do a dose response curve.

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Original Article   **Open Access**

Variation of Weight of Spleen in Different Age and Gender among Bangladeshi Cadaver

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Abstract

Background: Splenic infarction commonly occurs in patients with a massively enlarged spleen from myeloproliferative syndrome, portal hypertension or vascular occlusion produced by pancreatic disease, splenic vein thrombosis or sickle cell disease. **Objectives:** The purpose of the present study was to measure the weight of Spleen in Different Age and Gender to establish a normal standard. **Methodology:** This cross sectional descriptive study was done. The specimens were collected, from autopsy laboratory of the Department of Forensic Medicine and divided into three groups. **Results:** A total 80 human spleen were collected by purposive sampling technique. The mean weight was 81.00±42.28 gm in Group A, 92.26±34gm in group B, 69.87.67±62.65gm in group C. **Conclusion:** The mean weight of the spleen increased with the increases of age up to certain level then slightly decreased in the late age. *[Journal of Army Medical College Jashore, January, 2024;5(1):7-10]*

Keywords: Spleen; weight; age; sex; Bangladeshi cadaver

Introduction

The spleen is a large haemolymphoid organ consisting of vascular and lymphoid tissue and located in the left quadrant of the abdominal cavity between the fundus of the stomach and the diaphragm, opposite the left ninth to eleventh ribs. The size of the spleen roughly corresponds to the cupped hand or fist of the subject. Including the diaphragmatic and visceral surfaces, it has superior and inferior borders and anterior and posterior ends or poles[1]. Splenic parenchyma consists of white and red pulp that is surrounded by serosa and a collagenous capsule with smooth muscle fibres. Trabecular dense connective tissue rich in collagen and elastic fibres. These with the reticular framework, support the cells of the spleen and surround the vessels in the splenic pulp.

Spleen is an elastic, controllable reservoir that is important in adjusting the volume of the circulating blood. In life the spleen undergoes both rhythmic and passive contractions.

In part this activity is attributed to the smooth muscle in its framework[2,3]. As the largest unit of the mononuclear phagocyte system, the spleen is involved in all systemic inflammations, generalized hematopoietic disorders, and many metabolic disturbances. In each, the spleen undergoes enlargement, which is the major manifestation of disorders of this organ. It is rarely the primary site of disease[4]. Massive splenic enlargement frequently occurs in the tropics from malaria, Kala-azar and schistosomiasis. Occasionally, splenomegaly cannot be fully attributed to these diseases. It may result from occult infection or be related to malnutrition[2]. A normal spleen is not palpable. Only when enlarge almost twice its normal size, the spleen becomes clinically palpable under the left costal margin and its notched superior border faces inferomedially[1,5]. The colic flexure and the phrenicocolic ligament prevent a direct downward enlargement of the organ[6].

Splenic enlargement can be an important diagnostic clue to existence of mentioned disorder, but it can itself also cause problems. Enlargement of the spleen occurs in any blood-borne infection (Nonspecific Acute Splenitis) and spleen is enlarged upto 200 to 400 gm in this condition. In congestive splenomegaly caused by chronic venous

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congestion and extrahepatic portal vein or splenic vein, the spleen enlarged upto 1000 to 5000 gm. Because of its rich vascularization and sluggish circulation, the spleen sequesters a portion of the formed blood elements. The human lacks contractility, however, limiting its function in this regard. In human normal spleen contain only about 30 to 40 ml of red cells, but with splenomegaly, this is greatly increased. The normal spleen also harbors approximately 30.0% to 40.0% of the total platelet mass in the body. With splenomegaly, up to 80.0% to 90.0% of the total platelet mass can be sequestered in the interstices of the red pulp, producing thrombocytopenia. Similarly, the enlarged spleen can trap a sufficient number of white cells to induce leaukopenia[4]. Present study has been carried out to find the variations of weight of the spleen in Bangladeshi population and compare it with the works of many eminent authors in this field.

Methodology

Study Design and Population: The study was carried out in the Department of Anatomy at Mymensingh Medical College, Mymensing, Bangladesh during the period from June 2013 to July 2014. The specimens were collected from Bangladeshi cadavers, from autopsy laboratory of the Department of Forensic Medicine of Mymensingh Medical College, Mymensingh, Bangladesh.

Study Procedure: Only fresh specimens from persons who died within the preceding 12 hours were chosen. After collecting, the specimen was allowed to get fixed for 48 to 72 hours and preserved in 10.0% formol-saline solution. For convenience of differentiating the weight in relation to age and sex, the collected specimens were divided into three groups like Group A (upto 20 years), Group B (21 to 40 years) & Group C (41 to 60 years). Each group was again divided into male & female groups.

Statistical Analysis: In statistical analysis, differences between age groups and sexes were calculated by using one-way ANOVA test and unpaired 't' test respectively. All data were recorded in the pre-designed data sheet, analyzed by SPSS program and compared with the findings of other national and international studies and standard text books.

Ethical Clearance: Protocol of this study was approved by Ethical Review Committee of Mymensingh Medical College, Mymensing.

Results

For this study 80 human spleen were collected by purposive sampling technique from October 2013 to April 2014, among them 47 were male and 33 were female. It was evident from the table I that the maximum weight of the spleen was 193gm in Group A, 218gm in Group B and 314 gm in Group C. The minimum weight of spleen was 18 gm in Group A, 35gm in Group B and 34gm in Group C. The mean weight of the spleen was maximum in group B, 99.38gm in male and 87.11gm in female and minimum

in group A, 83.50gm in male and 76.00gm in female (Table 1).

Table 1: Mean Weight of Spleen in Different Age Groups

Age Group	Number of Specimen	Weight (gm) Mean ± SD (Minimum – Maximum)
A (0 To 20 Years)	28	81.00±42.28 (18 - 193)
B (21 To 40 Years)	31	92.26±34.00 (35– 218)
C (41 To 60 Years)	21	69.87.67±62.65 (34 – 314)

The mean (±SD) weight was 81.00±42.28 gm in group A, 92.26±34gm in group B, 69.87.67±62.65gm in group C and it was also observed that the mean weight of the spleen increased with the increases of age up to certain level then slightly decreased in the late age (Table 1).

The average weight was maximum in Group B (92.26gm) and was minimum in Group A (81.00gm). The mean difference of weight of the spleen between group A & B and group B & C was statistically insignificant at P>0.05 level but difference between group C & A was statistically significant at P<0.05 level (Table 2).

Table 2: Comparison of Weight of Spleen among the Age Groups

Comparison between Variables		Mean Difference	Std. Error	P Value
A	B	3.89	16.20	0.814
A	C	84.00	48.35	0.121
B	C	87.89	39.30	0.049

P<0.001 is considered as Highly significant; P<0.01 is considered as Moderately significant; P<0.05 is considered as Significant; P = or >0.05 is considered as Non-significant

Table 3 depicts that the mean weight of male spleen was 83.50±33.77, 99.38±47.55, 89.75±67.54gm, which was higher than the weight of female spleen 76.50±56.35, 87.11±21.45, 81.00±49.43gm in Group A, B and C respectively.

Table 3: Mean Weight of the Spleen in Different Sex

Age Group	Gender	N	Mean± SD Weight in gm
A (0 to 20 Years)	Male	18	83.50±33.77
	Female	10	76.50±56.35
B (21 to 40 Years)	Male	13	99.38±47.55
	Female	18	87.11±21.45
C (41 to 60 Years)	Male	16	89.75±67.54
	Female	5	81.00±49.43

Variance analysis shows that there was no significant difference in mean weight between the groups, where for

group A t=0.937 and P=0.392, for B group t=0.663 and P=0.529 and for group C t=0.949 and P=0.517 (Table 4).

Table 4: Comparison of Weight of the Spleen between Sexes

Age Group	Mean Difference between sex	Std. Error Difference	t	P Value
A	31.5	33.63	0.937	0.392
B	11.5	17.35	0.663	0.529
C	145.5	153.28	0.949	0.517
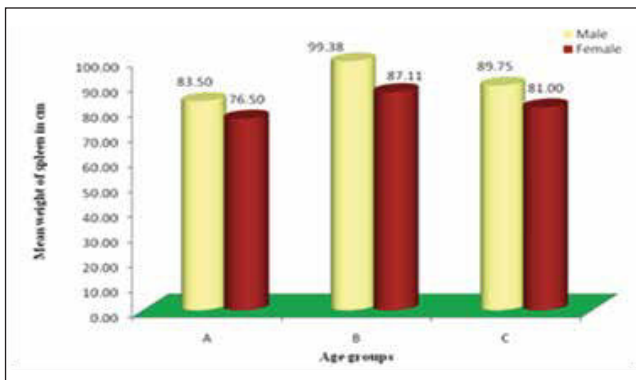
Figure I: Bar diagram representing the mean weight of spleen in different sex groups.

Discussion

The weight of the normal spleen has an immense importance both for clinical and surgical approach. A normal spleen is not palpable. Only when enlarge almost twice its normal size, the spleen is become clinically palpable under the left costal margin. In order to evaluate the clinical significance of splenic size, it is helpful to know the normal range of organ size relative to specific sex or age group. To establish a standard weight for normal spleen in Bangladeshi cadaver, the present study was carried out on 80 spleens of Bangladeshi cadaver and found that, the maximum weight of the spleen was 193gm in Group A, 218gm in Group B and 314gm in Group C. The minimum weight of spleen was 18gm in Group A, 35gm in Group B and 34gm in Group C. The mean (±SD) weight was in Group A 81.00±42.28gm, B 92.26±34gm, C 69.87.67±62.65gm and it was also observed that the mean weight of the spleen increased with age up to certain level then slightly decreased at the late age. The mean difference of weight of the spleen between group A & B, group B & C was statistically not significant but difference between group C & A was statistically significant. In the present study mean weight of the spleen was higher in male than that of female in Group A, B & C. There was no significant difference of weight of the spleen between male and female.

Chowdhury studied 120 spleens of Bangladeshi cadaver and found that, mean weight of spleen was maximum 171 gm in male and 107gm in female in 31 to 46 years age group and minimum70 gm in male and 73 gm in female in up to 15 years age group7. In the present study the mean weight was maximum in Group B, 99.38 gm in male and 87.11 in female and was minimum in group A, 83.50 gm in male and 76.50 gm in female which was lower than the findings of Chowdhury's study.

Alim studied 60 spleens of different age group of Bangladeshi people and found that, highest mean weight of spleen was 83 gm in 40 to 49 years age group and lowest mean weight was 45 gm in above 60 years age group[8]. In present study the maximum and minimum mean weight of spleen was higher than this study.

Rayhan[9] studied on 70 spleens of Bangladeshi cadaver and observed that, the highest mean weight of spleen in 40 to 49 years age group was 104.69 gm and lowest mean weight was 61.00 gm in 0 to 21 year age group which was nearer to present study.

Standring et al[10] studied on human spleen and stated that, the size and weight of the spleen varied with age and sex. Thy also mentioned that the average adult weight of the spleen is about 150 gm (normal range: 80-300gm).

In present study the maximum mean weight of spleen was 92.26 gm in Group B and minimum was 81.00gm in Group A. The mean weight of male spleen was 83.50±33.77, 99.38±47.55, 89.75±67.54gm, which was higher than the weight of female spleen 76.50±56.35, 87.11±21.45 and 81.00±49.43gm in Group A, B, C respectively. It was observed from present study the maximum mean weight in male was higher than the female, which was supported by McCormick and Kashgarian[11].

In present study it was observed that the mean weight of the spleen was lower than the weight of European's Standard because splenic weight varies in normal people with sex and age and is in proportion to body weight, height and body surface area[12-13]. Different authors have different inclusion criteria and the results are stated in different ways, like different age grouping, mean weight or ranges, making it difficult to comparison with each other.

Conclusion

From the present study, it was concluded that the mean weight of spleen was found maximum in group B and minimum in group A. It was observed that the mean weight of spleen increased with age upto certain level then decreased in late age and there was significant difference between group C and A but no difference was found between other groups. It was also observed that mean weight was higher in male than female but the difference was not statistically significant in between sexes.

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Original Article   ***Open Access***

Knowledge Regarding COVID-19 among Adult Rural Population in a Selected Area of Jashore District

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Abstract

Background: The public adherence is essential for effective measure, which is affected by their knowledge, attitudes, and practices (KAP) towards COVID-19. **Objective:** The present study was undertaken to determine the socio-demographic characteristics and to assess their knowledge regarding COVID-19 among the adult rural populations in a selected area of Jhikargacha Upazila, Jashore District. **Methodology:** This descriptive type of cross-sectional study was conducted among adult rural population in selected villages of Jhikargacha Upazila, Jashore District of Bangladesh to assess their knowledge towards COVID-19. Their sociodemographic and knowledge related data were collected by using pre tested semi structured questionnaire. **Results:** In this study it was found that among 500 respondents Maximum (55.0%) respondents were female and rests were male. Minimum age of them was 18 and maximum was 97, majority of the respondents (27.2%) were in the age group of 18 to 27 years. Majority (31.2%) of them just completed secondary education and were housewife (47.6%) and among males 14.0% were farmer/day labor. Maximum (45.6%) respondents have mentioned the source of information was from the radio or television. Majority (86.8%) of them said that COVID-19 is transmitted by sneezing, coughing and handshake and said that the disease was caused by corona virus (73.0%). Regarding their knowledge of sign symptoms of the disease 89.4% respondents mentioned that the sign symptoms were fever, body, pain, runny nose, cough, sore throat, breathlessness. Maximum (83.6%) of the respondents had knowledge about the complications of COVID-19 and 64.4% of respondents were known to the treatment of COVID-19. According to knowledge regarding prevention 93.4% had knowledge about the preventive measures against COVID-19. Majority of them about 96.6% of total respondents had heard about COVID-19 vaccine which is provided by the government and 90.4% mentioned that precautionary measures must be maintained strictly even after being vaccinated. **Conclusion:** There is a different level of knowledge regarding COVID-19 among respondents in the study area. *[Journal of Army Medical College Jashore, January, 2024;5(1):11-15]*

Keywords: Knowledge; COVID-19; rural population

Introduction

Corona viruses are a family of viruses known for containing strains that cause potentially deadly diseases in mammals and birds. In humans they're typically spread via airborne droplets of fluid produced by infected individuals. Scientists have known of the human corona virus since the 1960s. But only rarely has it garnered wider recognition over the past half a century. During the mid-1990s these viruses were described as the backwater of virology, since none caused serious disease in humans. However, this changed in 2002-03 with the emergence of a corona virus causing severe acute respiratory syndrome (SARS-CoV), and then in 2012 the Middle East respiratory syndrome corona virus (MERS-CoV) in Saudi

Arabia. The origin of both viruses was thought to be in bats, with civet cats and dromedary camels being the confirmed zoonotic reservoirs for SARS-CoV and MERS-CoV, respectively[1,3].

The outbreak caused by the most recently discovered corona virus SARS-CoV-2, a member of a family of viruses that usually cause respiratory illness. It was unknown before the outbreak began in Wuhan, China, in December 2019. It was linked epidemiologically to the Hua Nan seafood and wet animal wholesale market in Wuhan[2-3]. The virus rapidly spread to all provinces in China, as well as a number of countries across the globe, and was declared a Public Health Emergency of International Concern by the Director General of the World Health Organization on 30 January 2020. Corona virus disease (COVID-19) has been declared pandemic by the World Health Organization on the 11th March 2020[4]. In Bangladesh, the first confirmed case was reported on 8 March 2020[5]. The magnitude and rapid proliferation of COVID-19 through slightly symptomatic or asymptomatic infected people in Bangladesh stresses the need to identify the behavioral responses of the population, such as to better address behavioral determinants of pandemic control[6]. Human-to-human transmission of SARS-CoV-2 has been widely shown in health care, community and family settings. Primarily, it spreads from person to person by close contact through small droplets of saliva or discharge from the nose, when an infected person coughs sneezes or exhales. People infected with SARS-CoV-2 may not have the symptoms, but can transmit the virus.

The CDC estimates asymptomatic cases are 75 percent as infectious as symptomatic ones, but the agency cautions that this assumption is based on a murky understanding of what's known as "viral shedding," in which people unknowingly release contagious virus into the atmosphere. The two concerning features of this virus are low pathogenicity and high transmissibility, which has led to an exceedingly high prevalence and fatalities caused by it, as compared to its predecessors[7]. Preventive measures play an important role in breaking the chain and spread of the disease. Public awareness and their attitude toward preventive measures will play an important role in its containment. It is relatively a new disease with a very high rate of infectivity; hence, it is important to educate the public about its mode of spread and preventive measures. A large percentage of population lives in rural areas and might not have access to internet and gather this information. Knowledge, attitude, and practices of these rural inhabitants are going to play a very crucial role in the prevention and control of COVID-19 pandemic in near future. The present study was undertaken to determine the socio-demographic characteristics and to assess their knowledge regarding COVID-19 among the adult rural populations in a selected area of Jhikargacha Upazila, Jashore District.

Methodology

Study Settings and Population: This descriptive type of cross sectional study was conducted to assess the knowledge regarding COVID-19 among the adult rural population in a selected area of Jhikargacha Upazila, Jashore District, Bangladesh from January 2022 to January 2022. According to the study objectives the study was designed with description of knowledge related factors.

Study Procedure: All the available adult people of selected villages who were willing to participate and aged between 18 to 97 years were purposively selected. The total study population was 500 and data was collected by face to face interview with the respondents using semi-structured questionnaires.

Statistical Analysis: Data entry and analysis was done after organizing the data and coding techniques. Statistical analysis was performed by Statistical Package for Social Science (SPSS) Version 22.0. The descriptive statistics such as frequencies, percentages were done and data was summarized. Important tables and diagram were prepared on the basis of the findings relevant to the study.

Ethical Clearance: To obtain the required approval the research protocol was submitted to the Institutional Review Board (IRB). The study objectives were explained to each participant and written informed consent was taken from the respondents who willingly participated in the study.

Results

Out of total 500 adult rural populations both male and female of aged between 18 to 97 years were included. All of the respondents (100.0%) have heard about COVID-19. After completion of data collection all the data were compiled, tabulated and analyzed according to the objective of the study. The results of the study discussed in the following sections.

The minimum age of the respondents was 18 years and maximum age was 97 years. The majority of the respondents 27.2% were in the age group of 18 to 27 years. Maximum (55.0%) respondents were female. Maximum respondents (31.2%) completed Secondary education and only (7.4%) respondents were Graduate. Among the participants 15.6% cases were illiterate and only 28.6% cases completed primary level in terms of educational status. Out of 500 respondents' maximum (47.6%) were housewife and 3.4% respondents were unemployed and 13.2% cases were in others category like singer, dancer, actor and so one (Table 1).

Out of 500 about 45.6% respondents have mentioned the source of information about COVID-19 was radio or television (Table 2).

Majority of the respondents said that the occurrence was by corona virus (73%) (Figure I).

Table 1: Distribution of Respondents by Socio-Demographic Characteristics (n=500)

Variables	Frequency	Percent
Age Group		
• 18 to 27 Years	136	27.2
• 28 to 37 Years	116	23.2
• 38 to 47 Years	88	17.6
• 48 to 57 Years	83	16.6
• 58 to 67 Years	52	10.4
• 68 to 77 Years	18	3.6
• 78 to 87 Years	6	1.2
• 88 to 97 Years	1	0.2
Gender		
• Male	225	45.0
• Female	275	55.0
Educational status		
• Illiterate	78	15.6
• Non formal education	25	5.0
• Primary Education	143	28.6
• Secondary Education	156	31.2
• Higher secondary	61	12.2
• Graduate	37	7.4
Occupation		
• Day labor/Farmer	70	14
• Service	43	8.6
• Business	66	13.2
• Housewife	238	47.6
• Unemployed	17	3.4
• Others	66	13.2

Table 2: Distribution of Respondents according to Sources of Information (n=500)

Source of Infection	Frequency	Percent
Doctor	23	4.6
Nurse	2	0.4
Health Worker	12	2.4
NGO	10	2.0
Neighbors	101	20.2
Relative	107	21.4
Radio/TV	228	45.6
Newspaper	12	2.4
Billboard/posters	5	1.0
Total	**388**	**100.0**

Majority (86.8%) of the respondents said that COVID-19 is transmitted by sneezing, coughing and 9.2% of the respondents were unknown about the mode of transmission of COVID-19. Regarding symptoms most of them (89.4%) mentioned that they are known to the common symptoms of COVID-19. Among them (89%) said that diagnosis of the disease is possible by certain tests. About 73.4% of respondents were known to the symptomatic treatment of
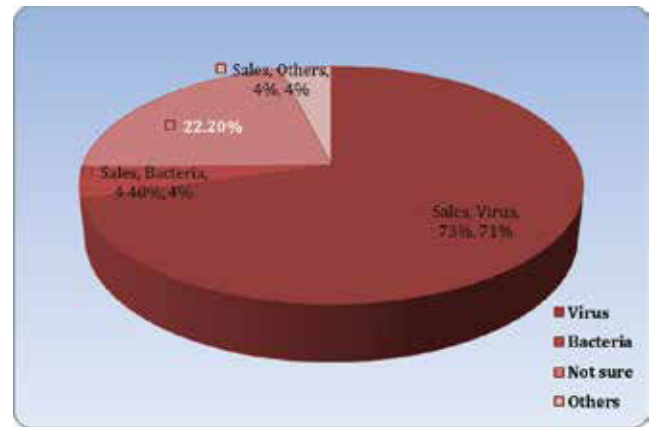

Figure I: Distribution of Respondents According to Knowledge of COVID-19 Aetiology (n=500)

Table 3: Distribution of respondents according to their knowledge regarding COVID-19 (n=500)

Knowledge Variables	Frequency	Percent
Mode of transmission of COVID-19		
• Sneezing, coughing	434	86.8
• Unknown	46	9.2
• Others	20	4.0
Symptoms of COVID-19		
• Fever, body ache, Runny nose, cough, sore throat and breathlessness	447	89.4
• Rash, Headache	14	2.8
• Unknown	37	7.4
• Others	2	0.4
Diagnosis of COVID-19		
• By certain tests	445	89.0
• Unknown	15	3.0
• Others	40	8.0
Treatment of COVID-19		
• Treatment is available according to symptoms	367	73.4
• Unknown	100	20.0
• Others	33	6.6
Complications of COVID-19		
• Pneumonia, respiratory distress, heart problems, organ damage, shock, death	418	83.6
• Unknown	76	15.2
• Others	6	1.20
Preventive Measures		
• Maintaining social distance, wearing mask, getting vaccinated.	467	93.4
• Unknown	23	4.6
• Others	10	2.0
COVID-19 Vaccine		
• COVID-19 vaccine is available and provided by the Government.	480	96.0
• Unknown	20	4.0
Need to take Precautionary Measures Even After Being Vaccinated		
• Yes	452	90.4
• No	31	6.2
• Unknown	17	3.4

COVID-19. Maximum (83.6%) of the respondents have knowledge about the complications of COVID-19. Total 467 out of 500 respondents (93.4%) had knowledge about the preventive measures against COVID-19. Most of them (96%) have heard about the COVID-19 vaccination which is provided by the Government. Maximum respondents (90.4%) mentioned that precautionary measures even after being vaccinated needs to be taken properly and 6.20% of total respondents think that there is no need of precautionary measures even after being vaccinated (Table 3).

Discussion

The objective of the study was to assess the knowledge regarding Covid-19 among adult rural population in a selected area of Jashore District. Total 500 adult male and female from various villages of Jhikorgachha upazila of Jashore District participated in this study. Interviewer administered questioners were used as research instrument which included socio demographic characteristics and knowledge related information's of the respondents.

A total of 500 individuals in villages of Jhikorgachha Upazila of Jashore district were interviewed. Both adult male and female participated in the study with 100.0% response rate. The current study found that a total of 55% of respondents were female and rests were male. Among the respondents 27.2% were in the age group of 18 to 27 years. Among them 31.2% of the respondents were completed secondary level of education and 15.6% were illiterate and only 28.6% completed primary level in terms of educational status. About 47.6% of the female respondents were housewives, and among males 14% were day labour or farmer and 8.6% were service holder. Among them 100% of the respondents have heard about COVID-19. About 45.6% respondents have mentioned the source of information from the radio-television. Majority of them 86.8% respondents know that COVID-19 is transmitted by sneezing, coughing. Maximum 73.0% cases of the respondents said that the occurrence was by corona virus. Most of the respondents 89.4% mentioned that they are known to the symptoms about COVID-19. Majority of them 83.6% of the respondents had knowledge about the complications of COVID-19. Most of them (64.4%) were known to the treatment of COVID-19. Among them 467 (93.4%) had knowledge about the preventive measures against COVID-19. Majority of them 96.0% of total respondents had heard about COVID-19 vaccine that is provided by the Government. Maximum respondents (90.4%) mentioned that precautionary measures even after being vaccinated need to be taken properly.

Most of the study populations having the appropriate knowledge about cause of the disease, symptoms, mode of transmission, availability of the treatment, preventive measures, social distancing, vaccine, complications, precautionary measures even after being vaccinated need to be taken properly. And they mentioned the source of information from the radio-television. Knowledge about the signs and symptoms of corona virus disease was at a high level among people providing correct answers in this study. This compares with studies in various countries, including China8, USA9 and India[10], revealed that people are highly aware of corona virus, due to information in the mass media, including radio, television, social media, and official authorities' efforts like the Ministry of Health programs. These findings are consistent with the studies of Zhong et al[8] conducted among the Chinese residents and of Alzoubi et al[11] conducted among the students in Jordan. Alzoubi et al[11] mentioned that the commonest source of knowledge of their participants was social media.

Previous study among 1549 adult population across Bangladesh including Dhaka city and rural areas found that 69.8% cases had the appropriate knowledge on mode of transmission and 51.6% cases of the study population, having adequate knowledge about the disease but only 52.1% about using face mask (p>0.05) and 51.8% about hand washing (p>0.05).More than 70.0% respondents had knowledge on social distancing[12]. Their knowledge regarding the availability of vaccines and treatment were also similar with other studies. This also supported by the positive attitude of the study population towards the measures including use of face mask, hand washing, use of hand sanitizer and social distancing. The findings of this study are the reflection of the effectiveness of the different awareness campaign conducted by the different agencies both in private and public sectors specially the health authorities in Bangladesh.

Hopefully, under the combined efforts of government and private Bangladesh surely will win the battle against COVID-19 in the near future. Due to the limitation in representativeness of the sample, more studies are warranted to investigate the knowledge towards COVID-19 among rural population of low economic status and rural background. Inadequate knowledge regarding the symptoms of the disease may mislead them for COVID-19 test or to avail services at the health facilities, causing wastage of resources in a developing country like Bangladesh. Public awareness campaign should be enhanced critically focusing the target audience to cover the knowledge gaps, motivation for appropriate practices and further improvement of attitudes towards prevention and control of the COVID-19 in the country are thus suggested. Moreover, further studies are suggested to assess the Knowledge and attitude, practice towards the COVID-19 among the rural population, as limitations in representativeness of the rural sample.

Conclusion

The study population belonged to the rural area of Bangladesh, and there is different level of knowledge regarding Covid-19 among respondents in the study area. Public awareness is necessary to address the knowledge

gap revealed by this study. Hence it is necessary to organize the public education program to prevent the people from the outbreak of the disease by increasing level of Knowledge so that they can attain positive attitude and adopt desired behavioral changes. Our findings suggest that rural population of Bangladesh have good knowledge towards COVID-19 during the rapid rise period of the pandemic outbreak. In addition, effective health education programs should be aimed at improving COVID-19 knowledge is helpful for encouraging an optimistic attitudes and maintaining safe practices. Public awareness is necessary to address the knowledge gap revealed by this study. Hence, it is necessary to organize the public education program to control and prevent the disease of by increasing level of knowledge so that they can attain positive attitude and adopt desired behavioural changes.

Conflict of interest
No conflict of interest.

Authors' Contributions
Tamanna N, Alam GN conceived and designed the study, analyzed the data, interpreted the results, and wrote up the draft manuscript. Afroz NT, Refat Z was involved in the manuscript review and editing. All authors read and approved the final manuscript.

Data Availability
Any inquiries regarding supporting data availability of this study should be directed to the corresponding author and are available from the corresponding author on reasonable request.

Ethics Approval and Consent to Participate
Ethical approval for the study was obtained from the Institutional Review Board. The written informed consent was obtained from all study participants. All methods were performed in accordance with the relevant guidelines and regulations.

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Original Article   ***Open Access***

Effect of Ginger (*Zingiber officinale*) Extract on Body Weight, Serum ALT Level and Histopathology of Liver on Paracetamol–Induced Hepatotoxicity in *Wister Albino* Male Rats

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Abstract

Background: Ginger is one of the most commonly used spices and integral part of our diet which may have hepatoprotective effect. **Objective:** The purpose of the present study was to assess the hepatoprotective effect of ginger (Zingiber officinale) on paracetamol induced hepatotoxicity in Wister albino male rats. **Methodology:** This animal study was carried out in the Department of Physiology at Sir Salimullah Medical College (SSMC), Dhaka, Bangladesh from July 2021 to June 2022 for a period of one year. Apparently healthy Wister Albino male rats, 90 to 120 days old, weighing between 200 to 250 gm were taken for the study. After acclimatization for 14 days, they were divided into three groups. Group A was treated as negative control and group B was treated as positive control group. Whereas group C was treated as experimental group. Each group consisted of eight (8) rats. All the rats received basal diet for 28 days. In addition to basal diet Group B received paracetamol orally (2g/kg bw/day) for last 3 days (26th to 28th days) of the study period. Group C received aqueous extract of ginger orally (400mg/kg bw/day) by gastric gavage for 28 days and paracetamol orally (2g/kg bw/day) for last 3 days. All the rats were sacrificed on 29th day. Blood was collected for final ALT estimation, done at BSMMU. Histopathology of liver was done in the Department of Pathology in SSMC. **Results:** The mean (±SD) initial body weight of group A, group B and group C were almost similar and the differences were not statistically significant. Whereas, the mean (±SD) final body weight was significantly increased in group A (p<0.001), group B (p<0.001) and group C (p<0.01) in comparison to that of their initial body weight. The mean final body weight of group C was non significantly higher than group A. The mean (±SD) final body weight was lower in group B in comparison to group A (p>0.05). Again the mean (±SD) final body weight was significantly (p<0.05) higher in group C than that of group B. The mean (±SD) final serum ALT level was significantly higher in group B (p<0.001) and group C (p<0.01) in comparison to that of initial ALT level of both groups respectively. **Conclusion:** The present study reveals that ginger has hepatoprotective effect against paracetamol induced hepatotoxicity in Wister Albino male rats. *[Journal of Army Medical College Jashore, January, 2024;5(1):16-21]*

Keywords: Hepatotoxicity; ginger; paracetamol; Wister Albino male rat

Introduction

Liver is a vital organ of the body. It is essential for life as it plays a crucial role in metabolism of carbohydrate, protein, fat. Liver is the site of decomposition of erythrocytes and storage of glycogen[1]. Therefore, maintenance of a healthy liver is necessary for overall wellbeing of an individual[2]. Although there has been tremendous development in the field of medical science but still liver disease is one of the major causes of

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morbidity and mortality in UK[3]. In Bangladesh about 13.2% patients are suffering from liver disease[4].

Liver disease is mostly caused by exposure to viruses, toxic chemicals, environmental pollutants and certain drugs such as diclofenac[5], acetaminophen[6] and so one. Paracetamol (acetaminophen) is used as an antipyretic and analgesic drug worldwide. It is safe when used at therapeutic dose but intentional or unintentional overdose causes hepatotoxicity[7]. Consumption of paracetamol in therapeutic dose is safe as it is biotransformed and eliminated as non-toxic conjugates of sulphate and glucuronic acid. High doses of paracetamol saturate detoxification pathways, leading to production of excessive N-acetyl-p-benzoquinone imine (NAPQI) by cytocrome P-450 system and causes glutathione depletion, producing massive cellular damage and tissue necrosis[5]. Being a dose dependent, classic predictable hepatotoxin, paracetamol is the most common cause of drug induced liver disease necessitating transplantation in the United States[8].

Although certain drugs like NAC (N-acetylcysteine) are available for hepatoprotection but they have some side effects also such as fever, fatigue, stomatitis, depression and cough and the most frequent symptoms were mainly gastrointestinal upsets, with diarrhoea and nausea[9]. Susceptibility of the body to the oxidative damage is determined by balance between the production and scavenging of reactive oxygen species (ROS) or free radicals[10]. This balance is crucial for preventing damage caused by oxidative stress of paracetamol toxicity[11]. Antioxidant play role in scavenging the free radicals. The most commonly applied antioxidants are synthetic phenols, such as, butylated hydroxytoluene and butylated hydroxyanisole (BHA). However, their safety is doubtful[12]. Therefore, the use of natural antioxidants has come to the limelight.

Ginger is the rhizomes of the plant Zingiber officinale (Family Zingiberaceae), has been used as one of the most popular culinary agent and spice since ancient time[13]. It is cultivated worldwide. Apart from its culinary use, ginger also possesses medicinal properties, and has been used historically in common cold, headache and nausea. Studies have shown that the unique culinary and medicinal properties of ginger is due to presence of some phytochemicals like zingerone, shogaols, gingerols, α-zingiberene, zingiberenol[14]. In abroad preclinical studies carried out with laboratory animals showed that ginger possess hepatoprotective effect to protect the liver against the toxic effects of xenobiotic agents like acetaminophen, CCl$_4$, heavy metals like Mercury[16] and Lead[17]. The purpose of the present study was to assess the hepatoprotective effect of ginger (*Zingiber officinale*) on paracetamol induced hepatotoxicity in Wister albino male rats.

Methodology
Study Settings and Population: This study was designed

as experimental animal study. This study was conducted in the Department of Pharmacology at Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh. The study period was July 2021 to June 2022 for a period of one year. Apparently healthy Wister Albino male rats with 90 to 120 days old weighing between 200 to 250 grams were collected from Department of Physiology at Bangabandhu Sheikh Mujib Medical University, Dhaka, Bangladesh. Unhealthy or diseased rats were excluded from this study.

Grouping of the Rats: After acclimatization for 14 days, all 24 rats were divided into three groups designed as group A, group B and group C. Group A was known as negative control group which was consisted of eight (8) Wister albino male rats. Group B rats were named as positive control group (Paracetamol treated control group) which was consisted of eight (8) Wister albino male rats. Group C rates was known as experimental group (Ginger extract pretreated and paracetamol treated group) which were consisted of eight (8) Wister Albino male rats.

Intervention: Group A (negative control group) was consisted of eight (8) Wister albino male rats. They received basal diet orally for 28 days. Group B rats (positive control group or paracetamol treated control group) was consisted of eight (8) Wister albino male rats. In addition to basal diet they received paracetamol orally (2 gm/kg bw/day) for last 3 days (26th to 28th days) of study period. Group C rates (experimental group or ginger extract pretreated and paracetamol treated group) were consisted of eight (8) Wister Albino male rats. In addition to basal diet, they received ginger extract orally (400 mg/kg bw/day) for 28 days and paracetamol orally (2 gm/kg bw/day) for last 3 days (26th to 28th) of study period. Dose of paracetamol was 2 gm/ kg body weight orally by gastric gavage with the duration for last 3 days (26th to 28th) of study period[19]. The dose of ginger extract was 400 mg/kg body weight orally by gastric gavage and the duration was daily in the morning between 9.00 AM to 10.00 AM for twenty-eight consecutive days (from day 1 to day 28)[20].

Study Procedure: According to selection criteria all the animals were purchased from animal house of BSMMU, Dhaka and the animals were kept in the animal house of Institute of Nutrition and Food Science, University of Dhaka, where the experiment was carried out. All the rats were acclimatized for 14 days prior to intervention at 27 to 28°C room temperature. They were kept under 12 hours dark - light cycle with free access to standard rat pellet diet and allowed drinking water as desired. All rat's body weight was measured at the beginning and at the end of study period. The serum level of alanine aminotransferase (ALT) was measured from tail vein of rats on day 1 and rats with normal serum level of ALT were included in this experiment. All the rats received basal diet for 28 days. Experimental group (group C) received aqueous extract of ginger 400mg/kg body weight in the morning between 9:00

AM to 10:00 AM for 28 days. Hepatotoxicity was induced by single daily morning dose of paracetamol 2gm/kg body weight orally by gastric gavage on 26th, 27th and 28th day in positive control group (group B) and experimental group (group C). At the end of the study period on (29th day) , all the rats (24) were sacrificed and blood samples were collected for estimation of final ALT. Livers were taken out for histopathology.

Statistical analysis: Statistical analysis was done by using Statistical Package of Social Science (SPSS) for windows version 23. Data were presented as mean ± SD. One-way ANOVA test and post hoc Bonferroni test were done to compare the data as applicable. Paired "t" test and Fisher's exact test were done as applicable. p value ≤0.05 was considered as level of significance.

Ethical Approval: Protocol was approved by Institutional Ethics Committee (IEC) of Sir Salimullah Medical College (SSMC), Dhaka, Bangladesh.

Results

Comparison between mean initial and final body weight and liver weight in different groups of rats (N=24). The mean (±SD) initial body weight of rats on day-1 were 211.88 ± 20.08, 221.94 ± 17.98 and 224.25 ± 10.10 gm, the final body weight on day-29 were 241.13 ± 20.19, 236.38 ± 19.96 and 266.38 ± 26.04 gm, the liver weight of rats were 24.95 ± 3.89, 43.85 ± 2.53 and 27.33 ± 1.19 gm in group A, B and C respectively (Figure I).
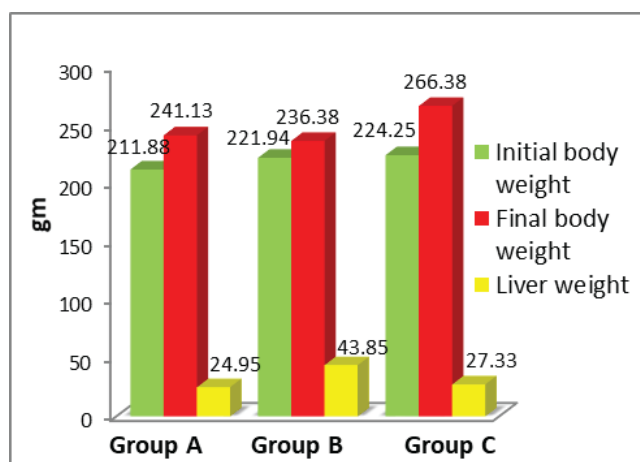

Figure I: Comparison between Initial &Final Mean Body Weight and Liver Weight

The mean (±SD) initial body weight of group A, group B and group C were almost similar and the differences were not statistically significant. Whereas, the mean (±SD) final body weight in group A, group B and group C were increased in comparison to their initial body weight. The mean (±SD) final body weight was lower in group B in comparison to group A, although the difference was not statistically significant. Again the mean (±SD) final body weight was significantly (p<0.05) higher in group C than

that of group B. The mean final body weight of group C was also higher than group A but the difference was not statistically significant. The mean (±SD) final body weight was significantly increased in group A (p<0.001), group B (p<0.001) and group C (p<0.01) in comparison to that of their initial body weight. The mean (±SD) liver weight was significantly (p<0.001) higher in group B in comparison to that of group A. Whereas the mean (±SD) liver weight was significantly (p<0.001) lower in group C in comparison to that of group B. The mean (±SD) liver weight of group C was also higher than group A but the difference was not statistically significant (Table 1).

Table 1: Multiple comparisons mean body weight and liver weight in different groups of rats (N=24)

Group	Initial body Weight P value	Final body Weight P value	Liver Weight P value
A vs B vs C	0.292ns	<0.05*	<0.001***
A vs B	0.690ns	1.000ns	<0.001***
A vs C	0.430ns	0.101ns	0.302ns
B vs C	1.000ns	<0.05*	<0.001***

Data are expressed as mean ± SD. For statistical analysis, one-way ANOVA test was performed for comparison among the groups and then post hoc-Bonferroni test to compare between groups. Figures in parentheses indicate ranges; Group A: Negative control group; Group B: Positive control group (paracetamol treated control group); Group C: Experimental group (ginger extract pretreated and paracetamol treated group); N= Total number of rats; n= number of rats in each group; ns = non-significant
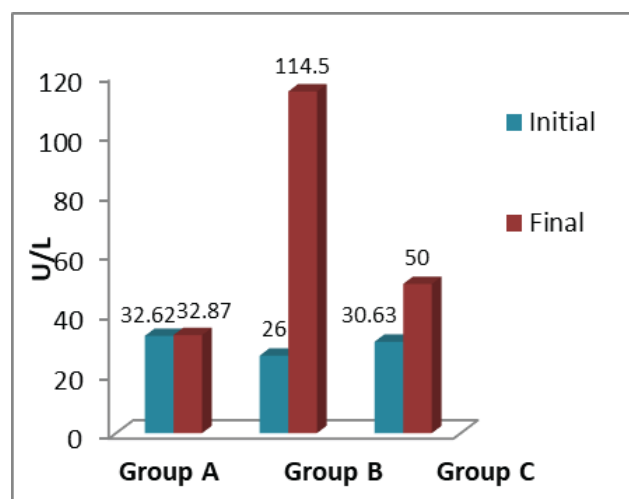

Figure II: Mean initial and final serum ALT levels in different groups of rats (N=24)

The mean (±SD) initial serum ALT levels were 32.62 ± 4.10, 26.00 ± 3.74 and 30.63 ± 5.83 U/L, mean final serum ALT levels were 32.88 ± 4.02, 114.50 ± 29.17 and 50.00 ± 3.74 U/L, in group A, group B and group C respectively (Figure II).

Table 2: Multiple comparison of mean serum ALT levels in different groups of rats on final day (N=24)

Group	Serum ALT P value
A vs B vs C	<0.001***
A vs B	<0.001***
A vs C	0.176ns
B vs C	<0.001***
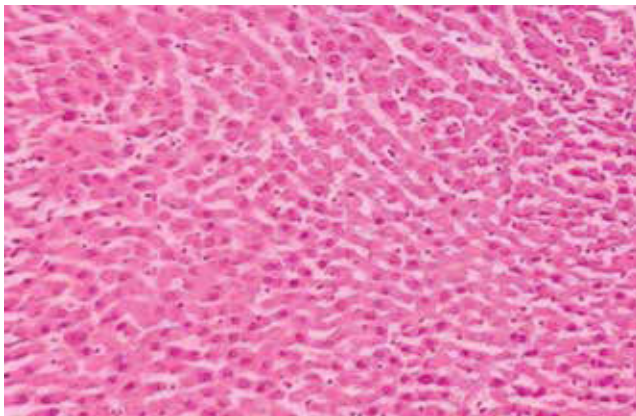
Photomicrograph 1: Architecture of liver in negative control group (here S represents hepatic sinusoids in X 400).
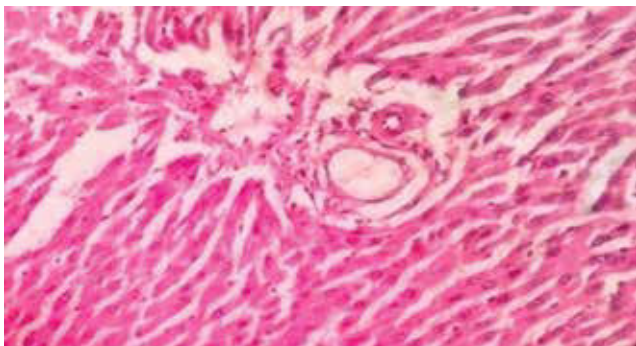
Photomicrograph 2: Architecture of liver in positive control group (here A represents dilated hepatic artery and V represents dilated portal vein in X 400)

Photomicrograph 3: Almost normal architecture of liver in experimental group (here arrow represents almost normal structure of hepatocyte X 400)

The mean (±SD) initial and final serum ALT levels were almost similar in group A and the differences were statistically non-significant. The mean (±SD) final serum ALT level was significantly higher in group B (p<0.001) and group C (p<0.01) in comparison to that of initial ALT level of both groups respectively (Table 2).
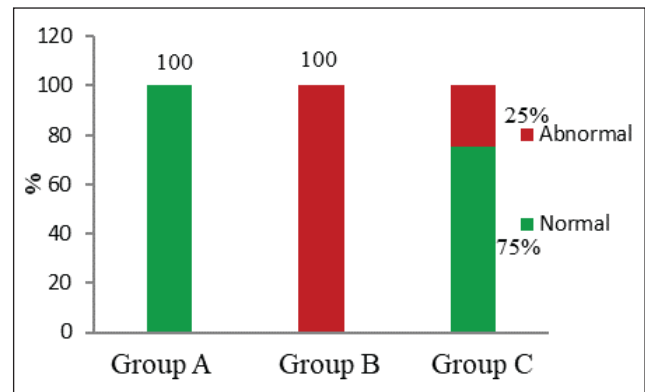
Figure 3: Mean distribution of rats liver by the histopathological findings in liver (N=24); Group A: Negative control group; Group B: Positive control group (paracetamol treated control group); Group C: Experimental group (ginger extract pretreated and paracetamol treated group); N= Total number of rats

Table 3: Multiple Comparisons of mean distribution of Rats Liver by the histopathological findings in liver (N=24)

Group	P value
A vs B	<0.001***
A vs C	0.467ns
B vs C	<0.01**

Statistical analysis was done by Fisher's exact test. Figures in parentheses indicate ranges;

Discussion

The present study was carried out to evaluate the hepatoprotective effect of ginger on paracetamol induced hepatotoxic rats. For the purpose of the study, serum levels of initial and final ALT were assessed. Moreover, histological examination of liver was also done to observe the microscopically findings of the liver.

Body Weight: In the present study the mean final body weight in negative control group, positive control group and experimental group were increased in comparison to their initial body weight. Farag et al[21] observed similar finding in a study where hepatotoxicity was induced by imidacloprid. On the contrary, the mean final body weight in positive control group was decreased in comparison to initial body weight in a study conducted by Ebeye et al[22]. This discrepancy might be due to different dose and duration of administration of paracetamol in his study. Again, in this study, the mean final body weight was significantly (p<0.05) increased in experimental group (ginger extract pretreated and paracetamol treated group) in comparison to that of positive control group. Similar

findings were also observed after induction of hepatotoxicity[21-26].

Liver Weight: In this study, liver weight was significantly (p<0.001) higher in positive control group and experimental group (ginger extract pretreated and paracetamol treated group) in comparison to that of negative control group. Again liver weight was significantly (p<0.001) lower in experimental group than that of positive control group. Similar finding was observed by Ebeye et al[22].

Serum Alanine Aminotransferase (ALT): In this study, serum ALT level was significantly (p<0.001) higher in positive control group than negative control group. Similar findings were observed by investigators of various countries[16,27-32]. Furthermore, serum ALT level was significantly (p<0.001) lower in experimental group (ginger extract pretreated and paracetamol treated group) than that of positive control group. Similar observation was made by[20,33-35].

Histological Changes in Liver: In the present study, abnormal histological changes such as presence of centrilobular necrosis, disorganization of hepatic sinusoids, infiltration of lymphocytes and kupffer cells, presence of fatty change and ballooning degeneration were observed in all rats treated with paracetamol in positive control group. Similar findings were observed in different other studies[29-31,34]. On the other hand, maximum number of rats in experimental group (ginger extract pretreated and paracetamol treated group) showed almost normal histological architecture of liver. This finding was also observed by different researchers of other countries[16,20,27,33]. In the present study, paracetamol induced hepatotoxicity was observed in Wister Albino male rats as evidenced by their measured higher serum level of ALT and histopathology of liver. These changes might be due to increased production of free radicals which initiate lipid peroxidation and subsequent cellular damage.

Again, Mean serum ALT level is significantly (p<0.001) lower in experimental group which suggested the possibility of the ginger extract having hepatoprotective effect against paracetamol induced liver injury. However, the exact mechanism involved cannot be elucidated from this study due to time and financial constraints.

There are some limitations of the study. Different doses of ginger extract were not used to find out the best effective dose. Anti-oxidant enzymes like superoxide dismutase (SOD), catalase (CAT), glutathione peroxidase (GPx), reduced glutathione (GSH) and succinate dehydrogenase (SDH) levels were not studied.

Conclusion

From this study it is concluded that ginger has hepatoprotective effect on paracetamol induced hepatotoxicity in Wister albino male rats. Regarding recommendation of the study, similar type of study with different doses of ginger and with different compounds of ginger extract. Estimation of anti-oxidant enzymes like superoxide dismutase (SOD), catalase (CAT), glutathione peroxidase (GPx) and so one. Evaluation of chronic model of hepatotoxicity.

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Original Article   **Open Access**

Demographic Characteristics and Socio-Economic Profiles of Morning Walkers at Largest Park of Dhaka City: A Community Based Survey

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Abstract

Background: Obesity is considered a principal public health concern and ranked as the fifth foremost reason for death globally. Objective: The purpose of the present study was to assess the demographic characteristics and socio-economic profiles of morning walkers at largest park of Dhaka city. Methodology: This cross-sectional study was conducted in Ramna park of Dhaka city, Bangladesh. The study period was January to December 2022 for a period of one year. The study population was visitors of Ramna park, Dhaka city. Adults who were not residents of Dhaka city. Convenience sampling technique was used in this study. According to the specific objectives of the study, first independent and dependent variables were identified. Taking into account the variables in detail, a semi-structured questionnaire was drafted to get information regarding variables. Before collection of data from study place, pre-testing of the questionnaire was done in Bailey road, Dhaka. Total 6 interviews were carried out. According to the finding of pre-testing necessary modifications were made in the questionnaire. Results: A total number of 260 respondents were recruited for this study after fulfilling the inclusion and exclusion criteria. The mean age with the SD of the study population was 36.47±9.174 years with the range of 20 to 80 Years. The male and female ratio was 2.5:1. Islam was predominant religion which was 246(94.6%) respondents and the rest of 14(5.4%) respondents were Hindu. Most of the study population were in the monthly income group of 20000 to 30000 TK and 30000 to 40000 TK which was 67(25.8%) respondents and 64(24.6%) respondents respectively. Service holder was the most common occupation types among the study population which was 161(61.9%) respondents. Higher Secondary level was the most common educational status among the study population which was 100(38.5%) respondents followed by graduate, SSC level and post-graduate which were 97(37.3%) respondents, 25(9.6%) respondents and 20(7.7%) respondents respectively. Only 18(6.9%) respondents were in primary education level. Conclusion: In conclusion middle age adult male middle class people are more commonly attending in the park as morning walker.
[Journal of Army Medical College Jashore, January, 2024;5(1):22-27]

Keywords: Demographic characteristics; socio-economic profiles; morning walkers; largest park; community survey

Introduction

The prevalence of overweight and obesity is increasing in Bangladesh especially among adults. The prevalence of overweight and obesity has been raised from 4 to 16% during the period between 1996 to 2011, according to Bangladesh Demographic and Health Survey (BDHS)[1]. Furthermore, the burden of overweight and obesity has been found to be higher among urban people in Bangladesh, the prevalence of obesity among urban women increased by 17.5% between 1996 and 2011[2]. In Bangladesh NCDs like hypertension, type II diabetes, cardiovascular diseases are increasing day by day. Obesity

is a modifiable risk factor of NCD. Some forms of cancer such as endometrial cancer, postmenopausal breast cancer and ovarian cancer have also been linked to overweight and obesity.

Ramna park is a large park and recreation area situated in the heart of Dhaka. In this park people from nearby areas like Bailey road, Ramna, Shantinagar, Kakrail and so one come for exercise and recreation. These areas are reputed for numerous financial hubs, fast food restaurants and homes of ministers. This study will help the visitors of Ramna park better understand the relationship between various lifestyle factors and obesity and help them to promote health and adopt healthy lifestyle practices to address the issue of overweight and obesity[3]. Additionally, this study will assist National Public Health authorities in determining the relationship between various lifestyle factors and obesity and raising awareness about the benefits of regular physical activity in preventing chronic illness and improving people's health, particularly adults[4-6]. Promoting and educating healthy lifestyles in adults will essentially help the younger generation to understand the benefits and consequences of maintaining a healthy lifestyle. As non-communicable diseases are increasing in our country it is essential to study about one of the most important modifiable risk factors of NCD. Finally, this study seeks to support decision-makers looking to understand the impact of obesity on health in the general population and identify outcomes that can be used to guide health authorities and public health to further mitigate threats and effectively guide obese people globally. The purpose of the present study was to assess the demographic characteristics and socio-economic profiles of morning walkers at largest park of Dhaka city.

Methodology

Study Design and Population: This was a descriptive type of cross-sectional study. The study was conducted in Ramna park of Dhaka city, Bangladesh. The study period was January to December 2022 for a period of one year. The study population was visitors of Ramna park, Dhaka city. Adults who were not residents of Dhaka city. Convenience sampling technique was used in this study.

Pre-testing: According to the specific objectives of the study, first independent and dependent variables were identified. Taking into account the variables in detail, a semi-structured questionnaire was drafted to get information regarding variables. Before collection of data from study place, pre-testing of the questionnaire was done in Bailey road, Dhaka. Total 6 interviews were carried out. According to the finding of pre-testing necessary modifications were made in the questionnaire.

Data Collection Instrument: Pretested semi-structured questionnaires was used and BMI measurements were calculated as data collection instruments. The semi-structured questionnaire focused on

socio-demographic information of the respondents (i.e., age, sex, education level, and college). The BMI calculated by using formula [(weight in kg)/(height in m^2)]. Height measured by using Tolson height measuring tape and weight measured by using Osaka Digital Weight Machine. The third section focused on gathering information on lifestyle factors such as sleeping patterns, food habits, physical activity, and television/computer usage. The data was collected by face to face interview of respondents by researcher during the data collection period.

Quality Control & Quality Assurance: Pre-testing of the questionnaire was conducted to ensure that the language was simple and the questions were understandable. Final report writing was conducted by the researcher himself. Quality was also ensured during data analysis and report preparation with the necessary guidance from the department of Community Medicine, SSMC.

Statistical Analysis: After the data collection, data was checked, verified, compiled and analyzed using the SPSS (the statistical package of the social sciences) version 23.0 an IBM software. Basic descriptive statistics was run for all variables (including socio-demographic characteristics) to establish means and standard deviations for variables measured on continuous scales and frequencies and percentages for categorically measured variables. Chi-square and t-tests were used to determine association between variables. Additionally, the results were presented in tables, graphs, and charts with appropriate interpretation and explanation in accordance with the study's objectives.

Ethical Implication: Before data collection, permission was obtained from the Ethical Review Committee of Sir Salimullah Medical College, Dhaka, Bangladesh. All respondents were informed verbally and in writing about the study's purpose and objectives. Each participant provided written consent. There was no application of medical surgical or therapeutic intervention, no invasion of privacy, and no bodily or social risk. The information was treated with strict confidentiality. Every respondent had the right of refusal to participate in the study.

Results

A total number of 260 respondents were recruited for this study after fulfilling the inclusion and exclusion criteria. Table 1 showed the distribution of study population according to age group. Most of the study population were in the age group of 20 to 40 years which was 197(75.8%) respondents followed by 40 to 60 years' age group and less than 20 years which was 60(23.1%) respondents and 2(0.8%) respondents respectively. The mean age with the SD of the study population was 36.47±9.174 years with the range of 20 to 80 Years (Table 1).

Figure I showed the distribution of study population according to gender. Among 260 respondents' male was predominant than female which was 185(71.2%)

respondents and the rest of 75(28.8%) respondents were female. The male and female ratio was 2.5:1.

Table 1: Distribution of respondents according to Age Group (n=260)

Age Group	Frequency	Percent
Less Than 20 Years	2	0.8
20 to 40 Years	197	75.8
40 to 60 Years	60	23.1
More Than 60 Years	1	0.4
Total	**260**	**100.0**
Mean±SD (Range)	36.47±9.174(20 to 80 Years)	
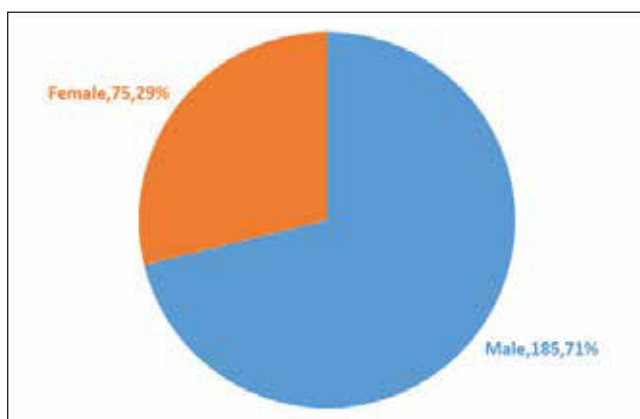
Figure I: Distribution of respondents according to Gender (n=260)

Table 2 showed the distribution of study population according to religion. Islam was predominant religion which was 246(94.6%) respondents and the rest of 14(5.4%) respondents were Hindu.

Table 2: Distribution of Respondents According to Religion (n=260)

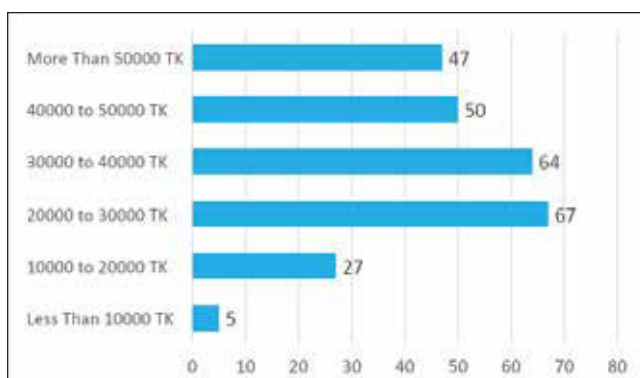| Religion	Frequency	Percent
Islam	246	94.6
Hindu	14	5.4
Total	**260**	**100.0**

Figure II: Distribution of respondents according to Family income (n=260)

Figure II showed the distribution of study population according to family income. Most of the study population were in the monthly income group of 20000 to 30000 TK and 30000 to 40000 TK which was 67(25.8%) respondents and 64(24.6%) respondents respectively. However, 40000 to 50000 TK group, and more than 50000 TK group were in 50(19.2%) respondents and 47(18.1%) respondents respectively. Furthermore, 27(10.4%) respondents were present in 10000 to 20000 TK.

Table 3: Distribution of Respondents According to Occupation (n=260)

Occupation	Frequency	Percent
Service Holder	161	61.9
Business	67	25.8
Homemaker	18	6.9
Student	14	5.4
Total	**260**	**100.0**

Table 3 showed the distribution of study population according to occupation. Service holder was the most common occupation types among the study population which was 161(61.9%) respondents followed by business, homemaker and student which were 67(25.8%) respondents, 18(6.9%) respondents and 14(5.4%) respondents respectively.

Table 4: Distribution of respondents according to Education (n=260)

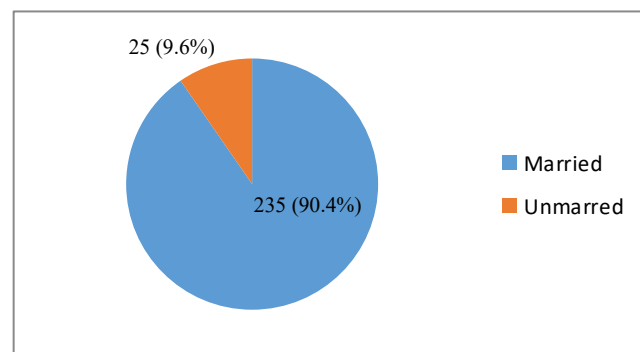| Education	Frequency	Percent
Primary Level	18	6.9
SSC Level	25	9.6
Higher Secondary	100	38.5
Graduate	97	37.3
Post-Graduate	20	7.7
Total	**260**	**100.0**

Figure III: Distribution of respondents according to Marital Status (n=260)

Table 4 showed the distribution of study population according to education. Higher Secondary level was the most common educational status among the study

population which was 100(38.5%) respondents followed by graduate, SSC level and post-graduate which were 97(37.3%) respondents, 25(9.6%) respondents and 20(7.7%) respondents respectively. Only 18(6.9%) respondents were in primary education level.

Figure III showed the study population according to marital status. Most of the study population were married which was 235(90.4%) respondents and the rest of 25(9.6%) respondents were unmarried.
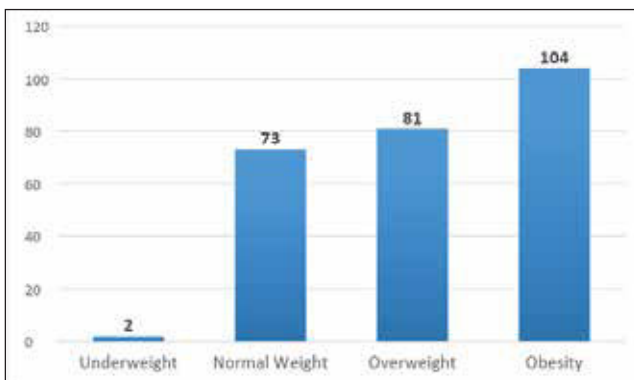

Figure IV: Showing the respondents according to BMI Group (n=260)

Figure IV showed the study population according to BMI group. Majority of the respondents were obese which was 104(40.0%) respondents followed by overweight and normal weight which were 81(31.2%) respondents and 73(28.1%) respondents respectively. However, only 2(0.8%) respondents were in underweight.

Discussion
The prevalence of obesity is increasing speedily in the world. It has been considered a public health concern. Approximately, 603 million adults are found to be obese globally in 2015, and this number has risen gradually since 1980[7]. Obesity is generally measured using body mass index (BMI)[8] which has been proven to increase the risk of hypertension, coronary heart disease, stroke, diabetes and other non-communicable diseases[3]. Abdominal obesity is associated with an increased risk of type 2 diabetes, cardiovascular disease, metabolic syndrome and all-cause mortality[4]. Several early studies reported the prevalence of obesity in Bangladeshi adults, but the associated factors in this country's population are not clear yet[9,10].
A total number of 260 respondents were recruited for this study after fulfilling the inclusion and exclusion criteria. The distribution of the study population according to age group was recorded. Most of the study population were in the age group of 20 to 40 years which was 197(75.8%) respondents followed by 40 to 60 years age group and less than 20 years which was 60(23.1%) respondents and 2(0.8%) respondents respectively. The mean age with the SD of the study population was 36.47±9.174 years with the

range of 20 to 80 years. From this study it is very clear that the young adults' people are the most common people coming to the Ramna Park in Dhaka city. This group of people are very much cautious about their health. Similar results have been reported[6,11-13] and have mentioned that young are most commonly concerned about obesity. In Bangladesh, obesity is very high among this young adult age group and this age group most commonly come to Ramna Park. This is consistent with another study[14,15].
The distribution of study population according to gender was recorded. Among 260 respondents' male was predominant than female which was 185(71.2%) respondents and the rest of 75(28.8%) respondents were female. The male and female ratio was 2.5:1. This results reflect that male are commonly found in the park. There is no clear cut indication about these findings. Female is suffering from the more obesity in Bangladesh which is inconsistent with the present study[16].
The distribution of study population according to religion was reported. Islam was predominant religion which was 246(94.6%) respondents and the rest of 14(5.4%) respondents were Hindu. Bangladesh is a Muslim majority country and this is more than 90.0%. That's why this high prevalence of Muslim are found in this study.
The distribution of the study population according to family income was recorded. Most of the study population were in the monthly income group of 20000 to 30000 TK and 30000 to 40000 TK which was 67(25.8%) respondents and 64(24.6%) respondents respectively. However, 40000 to 50000 TK group, and more than 50000 TK group were in 50(19.2%) respondents and 47(18.1%) respondents respectively. Furthermore, 27(10.4%) respondents were present in 10000 to 20000 TK. These results reflect the socio-economic status of the study population. Majority are found in the middle income group. According to ILO 41.6% of the developing world's citizens are middle class[17]. This group of people are the most common group.
The distribution of the study population according to occupation was recorded. Service holder was the most common occupation type among the study population which was 161(61.9%) respondents followed by business, homemaker and student which were 67(25.8%) respondents, 18(6.9%) respondents and 14(5.4%) respondents respectively. The distribution of the study population according to education was recorded. Higher Secondary level was the most common educational status among the study population which was 100(38.5%) respondents followed by graduate, SSC level and post-graduate which were 97(37.3%) respondents, 25(9.6%) respondents and 20(7.7%) respondents respectively. Only 18(6.9%) respondents were in primary education level. The study population according to marital status was recorded. Most of the study population were married which was 235(90.4%) respondents and the rest of 25(9.6%) respondents were unmarried.

The study population according to the BMI group was recorded. Majority of the respondents were obese which was 104(40.0%) respondents followed by overweight and normal weight which were 81(31.2%) respondents and 73(28.1%) respondents respectively. However, only 2(0.8%) respondents were underweight. Obesity is one of the major public health concerns due to its upward trend in both developing and developed countries[18-20] . According to the World Health Organization (WHO), about 39% of adults aged ≥18 years were overweight and 13% of adults were obese in the world in 2016[21-23]. Based on the WHO report, 1 in 3 of the world's adult population is overweight and 1 in 10 is obese. Undernutrition is more frequent in developing countries, however, over the past two decades, overweight and obesity are increasing rapidly in low to middle-income countries alongside undernutrition[24]. In another study, age-standardized and BMI based prevalence of obesity was 26.2% and WC based prevalence of abdominal obesity was 39.8% in rural Bangladeshi adults aged 20 years and over[25]. An increasing trend of obesity has been reported in females of reproductive age in South Asia between 1996 and 2006[26]. In another study, both general and abdominal obesity were associated with several metabolic abnormalities including hypertension, type 2 diabetes, cardiovascular disorders and metabolic syndrome[25-26].

Conclusion

In conclusion adults are more prone to obesity and are at a higher risk of developing it. Rather than focusing on obesity as an individual behavioral chronic state, current scientific evidence indicates the consideration of a multidisciplinary approach targeting the immediate environment of the obese individual to broader socioeconomic contexts. For such a venture to be fruitful in developing nations, the incentives at several levels of organizations, the media, and the educational institutions along with changes in food policies and distribution will need to be provided to low-income populations. Future research needs to focus on some of the key questions that remain unanswered, especially the understanding of the causal structure of the interrelationship between SES and obesity in developing countries.

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