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FACTORS DETERMINING THE CONSUMPTION OF PASTEURIZED MILK WITH SPECIAL FOCUS ON RECENT ANTIBIOTIC SCANDAL: A STUDY ON DHAKA UNIVERSITY STUDENTS

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Abstract

Milk consumption is one of the basic food habits that a person consumes for proper calcium and phosphorous required for the healthy growth of bones and teeth. It is also an essential ingredient for the growth and proper functioning of the body. However, a recent report published by DU professor ABM Faroque on the presence of antibiotics in pasteurized milk has brought about this topic in limelight. Consumers are now showing diversified consumption attitudes towards consuming pasteurized milk. This study has tried to analyze the factors that affect the consumption of pasteurized milk. For this, the consumption frequency has been selected as the outcome variable and the determinants of milk consumption (family income category and strength of belief on antibiotic scandal report) have been measured on the identified outcome variable. Interestingly, this study has found an inverse relationship between the family income category and the consumption of pasteurized milk. The estimated result with the Ordinary Least Square (OLS) method for the family income category indicates that if a person graduates from one income category to another then milk consumption decreases by .254 unit. This study also found a negative relationship between the consumption of pasteurized milk and the strength of belief in this report and this result matches our expectation. Therefore, concluding remarks is that believing this report has a significantly negative impact on the pasteurized milk consumption of Dhaka university students.

Keywords: Pasteurization, Antibiotic scandal, Whole milk, Semi-skimmed milk, Food contamination

1. Introduction

Milk has been considered as a great source of calcium and phosphorous required for the healthy growth of bones and teeth. For proper development, it is recommended that a person requires 200-250 ml of milk or 15-20 gram milk powder (DATABD.CO, 2019). However, in Bangladesh, per capita per day milk consumption stands only 27.31 ml, states HIES- in its 2016 survey report. In Bangladesh, the per capita per day milk consumption was 33.7 ml in 2010, and 32.4 ml in 2005, according to the two data of HIES published in the aforementioned years. It has been completely transparent the consumption of milk is decreasing year after year. The reason is the inadequate supply of dairy milk to the doorstep of consumers, mixing unhygienic substances to milk for making a profit, increasing the price of the milk, inappropriate preservation process to preserve milk, etc. To meet the excessive demand, marketers come up with pasteurized milk that has been heated to a specified temperature (generally 63°C) and time to kill pathogens that may found in the raw milk. This pasteurized milk has been trying to grab the milk market in Bangladesh with a promise to provide adequate calcium and phosphorus required for the healthy growth of a person. Nevertheless, a recent study conducted by Professor ABM Faroque, former director of the university's Biomedical Research Centre confirmed that all of the milk in the market contained with the traces of antibiotics that leads to a change in the attitudes of consumer towards consuming pasteurized milk.

1.1. Background of the research

Recently, Professor ABM Faroque in collaboration with Dhaka University's Pharmacy Faculty and Biomedical Research Centre has published a report on pasteurized milk. The researchers have found antibiotics in seven samples and detergent in three samples of pasteurized milk mostly sold in the kitchen market. This continuous consumption of this milk might mean that antibiotics will not work in your body when you need them for serious infection. Currently, the high court has suspended pasteurized milk production of 14 companies for 5 weeks (Dhaka Tribune, July 28th 2019). This phenomenon may have a severe impact on the consumption of pasteurized milk and consumers' preference and attitudes towards pasteurized milk may deteriorate shortly.

1.2. Objectives of the study

Broad objective: The broad objective of this study is to measure the factors that determine the consumption of pasteurized of Dhaka University students, specifically to those who reside at the hall, due to the recent antibiotic scandal.

Specific objectives: This research is conducted to achieve some specific objectives and purposes. These objectives are the following:

- To discuss the consumption pattern of the respondents towards pasteurized milk.
- To analyze factor that determines the consumers' and purchasing behaviour and consumption.

- To get into the problems faced by the respondents while consuming pasteurized milk.
- To examine the socio-economic profile of the students which are stimulating factors that determine the level of milk consumption of a student.
- Finally, to offer suggestions for the development of the pasteurized milk industry that enlightens the level of customer expectation.

1.3. Study question

This study will be conducted based on some research questions:

- What are the most important factors that influence consumer milk consumption?
- What is the impact of the recent antibiotic scandal on pasteurized milk consumption?
- Which factor does a consumer consider most importantly while purchasing pasteurized milk?
- How a milk producer can ensure the quality of milk according to the need of the consumer?

1.4. The rationale of the study

Milk consumption is always the priority for fulfilling the need for nutrition in our daily life. However, if this prime source of nutrition encounters the threat of adulteration (alloying antibiotics and detergents) then, certainly, our life is at stake. The recent antibiotic scandal has myriad impacts on conscious citizens including the choice of selecting milk as a source of nutrition. A significant portion of the milk consumer is students. They are literate and conscious about the hygienic factor of the food that they are consuming. So, the factors that determine the consumption of pasteurized milk of the students must be researched.

2. Literature review

Pasteurized milk is a raw milk that has been heated to a specified temperature (generally 63°C) and time to kill pathogens that may be found in the raw milk (HealthlinkBC, March 2016). Pathogens are microorganisms such as bacteria that make us sick. This pasteurization of milk has regarded as one of the most used tools for preserving milk for further consumption. Recently, a study, conducted by Professor ABM Faroque, former director of the university's Biomedical Research Centre confirmed that all of the milk in the market contained the traces of antibiotics. The researchers collected 10 new samples for testing, among them four samples contained with antibiotics and detergents, and the others contained with antibiotics. Confirming the findings, the pharmaceutical technology teacher told, "The same team of researchers, conducted tests on samples of the same milk brands collected from the same place. We also used the same apparatus from the last round of tests (bdnews24.com, 13th July 2019)."

This incident has myriad impacts on the consumption of pasteurized milk especially on health-conscious citizens including students. Their attitudes and perceptions may deteriorate towards milk. The residential students of the University of Dhaka, who are living in the hall, were used to drinking pasteurized milk from the packet directly without boiling are now tensed about their health issues. However, the gap between their perception and the perception of the pasteurized milk produces is enlarging which needs to be studied immediately for resolving these problems.

2.1. Research hypothesis

The hypotheses that have derived from the research questions include:

H0: Recent antibiotic scandal has no impact on pasteurized milk consumption

H1: Recent antibiotic scandal has a great impact on pasteurized milk consumption

2.2. Conceptual framework

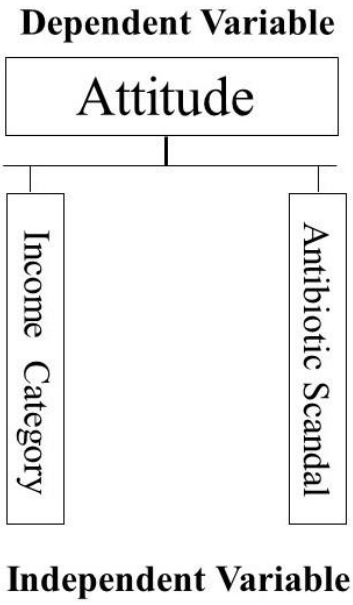

Figure 1. Research Variable

3. Research methodology

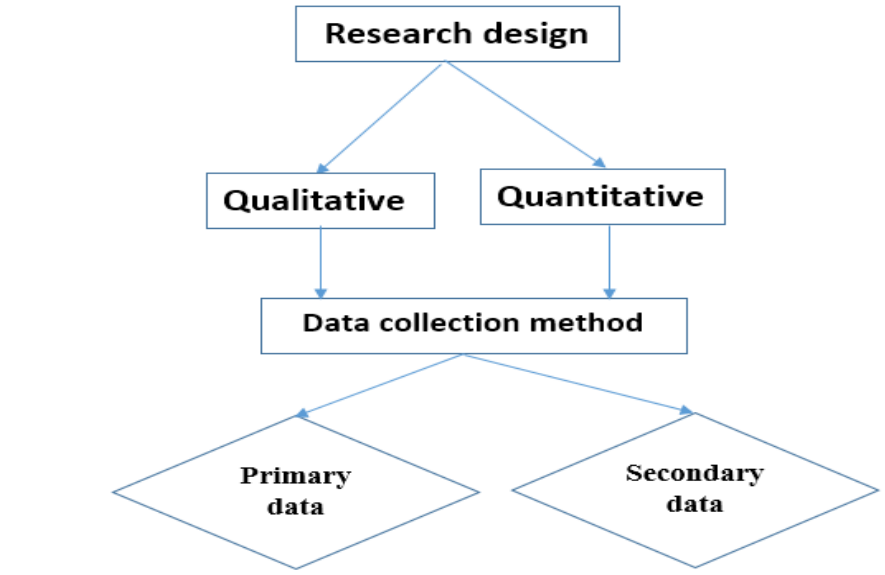

Figure 2. Research methodology at a glance

To analyze the data two types of research methodologies will be used in this paper. The Quantitative approach focuses more on numeric and accurate data and the qualitative approach focuses on non-numeric and qualitative data. Between the philosophy of anti-positivism and positivism, the positivism philosophy will be used here to attain the objectives and to get the result.

3.1. Research technique

Collecting, measuring, and evaluating research data for solving relevant problems and integrating all other factors research technique is used (Wheeler, 2003). This study was designed descriptively and all information was discussed from both qualitative and quantitative point of view. The information has been collected by conducting an online survey and related survey data to measure students' attitudes towards pasteurized milk consumption.

3.2. Population

Dhaka University students' especially those who reside at the hall were the target population for this study. The population includes both the male and female respondents.

3.3. Sampling frame

As a survey has been conducted online for accomplishing this study and most of the respondents are from Dhaka University, so certainly the sampling frame was so limited in this area. This sampling frame consists of a list or set of directories of those students who reside at the University hall and possess the information needed for this research.

3.4. Sampling technique

The sampling technique that has been used in this research is a simple random sampling that falls under the umbrella of the probability sampling technique. Because all the students of Dhaka University have an equal chance of being selected as respondents.

3.5. Sample size

The sample size for this study is around 70 who are finally selected for the study. It states that each sample represents the population characteristics.

3.6. Variable of the study

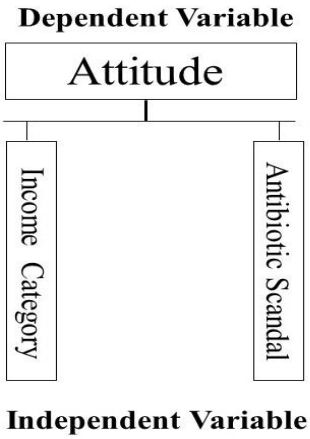

Figure 3. Research Variables

This research tries to measure the factors that determine the consumption of pasteurized milk that depends on strength of belief on the recent antibiotic scandal and family income category of the respondents. This consumption frequency is identified as the dependent variable and the family income category and the strength of belief of the respondents have identified as the independent variable. Our purposes are to see how much consumption changes due to the changes in the income category of the respondents and the strength of belief of the respondents on the recent antibiotic report.

3.7. Questionnaire design

The questionnaire has designed based on the literature review and relevant information that is needed for conducting the research. Question-wording has chosen carefully and all the biased and unambiguous questions have avoided as far as possible. Likert scale is also used in this paper so that the respondents can answer perfectly by taking into account their positive and negative feelings regarding pasteurized milk consumption.

3.8. Online survey and data collection

An online survey has been carried out to collect data from the respondents. Around 70 respondents have participated in that survey. An Online survey has chosen because of its easiness to collect data with little time and cost. These 70 respondents are somehow consume pasteurized milk and they have shown different attitudes towards consuming pasteurized milk. Their responses have recorded accurately for further research analysis.

3.9. Tools used for data analysis

Data has been analyzed in tabular form, percentage form with appropriate graphs and charts. To reach in conclusion about consumer attitude towards pasteurized milk and the impact of the recent antibiotic scandal on milk consumption, This study has used

- Regression Analysis
- Hypothesis Analysis
- Graphical Presentation

4. Data analysis and findings

4.1. Gender of the respondents

Out of 70 respondents, 44 were male and 26 were female.

Table 1. Frequency distribution of gender

Gender	Frequency	Percent
Male	44	64%
Female	26	36%
Total	70	100%

4.2. Econometric specification

The estimated model will be a multivariate model with two explanatory variables. The model can be specified as.

$$\mathbf{Y_i = \alpha + \beta_1 X_{1i} + \beta_2 X_{2i} + \varepsilon_i}$$

Here Y_i is the dependent variable, which indicates how often a respondent consumes pasteurized milk. The variable takes five values as follows

Y_i=1 if the respondent consumes milk once a month

Y_i=2 if the respondent consumes milk once in a week

Y_i=3 if the respondent consumes milk three times a week

Y_i=4 if the respondent consumes milk daily

Y_i=5 if the respondent consumes milk twice a day

The two explanatory variables are as follows.

X_{1i} = Family income category.

Which takes five values depending on which income category the family of the respondent belongs .

X_{1i} =1 if the i^{th} individual belongs to the lower-income category.

X_{1i} =2 if the i^{th} individual belongs to the lower-middle-income category.

X_{1i} =3 if the i^{th} individual belongs to the middle-income category.

X_{1i} =4 if the i^{th} individual belongs to the upper-middle-income category.

X_{1i} =5 if the i^{th} individual belongs to the higher income category.

X_{2i} = Strength of belief on the antibiotic scandal

X_{2i} =1 If the i^{th} individual strongly disagrees with the report on the antibiotic presence in pasteurized milk

X_{2i} =2 If the i^{th} individual disagrees with the report on the antibiotic presence in pasteurized milk

X_{2i} =3 If the i^{th} individual be Neutral with the report on the antibiotic presence in pasteurized milk

X_{2i} =4 If the i^{th} individual strongly agree with the report on the antibiotic presence in pasteurized milk

X_{2i} =5 If the i^{th} individual strongly agree on the with a report on the antibiotic presence in pasteurized milk

And finally.

ε_i = Stochastic error term

4.3. Coefficient analysis

Table 2. Coefficients[a]

Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.
	B	Std. Error	Beta		

1	(Constant)	4.526	.736		6.153	.000
	family income category	-.254	.179	-.171	-1.419	.160
	strength of belief on antibiotic scandal	-.288	.138	-.251	-2.087	.041

a. Dependent Variable: milk consumption frequency

Explanation:

Constant α= 4.52 indicates that even without any income and if no antibiotic scandal occurred the consumption of pasteurized milk will be 4.526

This study is expecting a positive correlation between family income and the consumption of pasteurized milk. Because it is common that higher-income indicates higher purchasing power and higher purchasing power induces the consumer to consume more milk. However, the estimated coefficient of family income variable X_1 ($\beta_{1=}$ -.254) indicates that there is an inverse relationship between the family income category and consumption of pasteurized milk. The value indicates that if a person graduates from one income category to another then milk consumption decreases by .254 unit. This can happen because higher income works as proxy variables of health consciousness and a health-conscious person thinks twice before purchasing pasteurized milk because of recent occurrence. This study can say that for every rise in family income category, .254 unit will decrease the consumption of pasteurized milk.

Recently DU professor ABM Faroque has published a report on the antibiotics in pasteurized milk.
The expectation is that there is a negative correlation between the consumption of pasteurized milk and the strength of belief in that report. Because we know that the higher the strength of belief on that report the lower the consumption of milk. However, the estimated coefficient of the strength of belief variable X_2 ($\beta_{2=}$ -.288) indicates that there is a negative correlation between the consumption of pasteurized milk and the strength of belief on this report. So this result matches our expectations. This study can say that for every level increase in the strength of belief the consumption will decrease by .288 unit.

The standard error of α =.736 indicates that the error rate is not very significant as it is close to zero.
The standard error of β_1 = .179 indicates that the error rate is not very significant as it is close to zero.
The standard error of β_1 = .138 indicates that the error rate is not very significant as it is close to zero.

The t ratio value of α and β_2 will give us an indication of the significance level. If the calculated t value is greater than 2.56 and -2.56, then as a rule of thumb it will be rejected at a 5% significance level. Here

the t ratio value of α and β_2 serially are 6.153 and -2.087, which means that all the value is greater than 2.56 and -2.56 and all the value is significant. So, reject the null hypothesis.

Again the p-value of β_1 is 0.16 which is greater than .05. So, the coefficient of β_1 is not significant and do not reject the null hypothesis.

4.4. Model summary

Table 3. Model summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.343[a]	.118	.091	1.336

a. Predictors: (Constant), the strength of belief on antibiotic scandal, family income category

Explanation:

The value R= .343 explains that there is a moderately negative correlation between the consumption of pasteurized milk and the income level & strength of belief on the antibiotic scandal. It has happened because This study has seen that there is an inverse relationship between family income and the consumption of pasteurized milk.

The value R Square=.118 indicates that a 12% variance of consumption of pasteurized milk can be explained by the independent variable of the strength of belief on antibiotic and family income.

4.5. ANOVA

Table 4. ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	15.923	2	7.962	4.462	.015[b]
	Residual	119.562	67	1.785		
	Total	135.486	69			

a. Dependent Variable: milk consumption frequency

b. Predictors: (Constant), the strength of belief on antibiotic scandal, family income category

From the ANOVA table, it can be seen that the significance value (.015) is smaller than 0.05 (significance level). As the value is smaller than the significance level, therefore null hypothesis is rejected. So this study can say that the recent antibiotic scandal has a great impact on pasteurized milk consumption

H0: μ1 = Recent antibiotic scandal has no impact on pasteurized milk consumption (Rejected)

H1: μ2= Recent antibiotic scandal has a great impact on pasteurized milk consumption (Accepted)

4.6. Types of milk respondents consume

Whole Milk is a kind of milk in which no constituent has been removed. Interestingly, most of the students love to drink whole milk although it contains fat. Around 48.50% of the respondents drink whole milk. They drink this milk from the little mobile shop or hawker who is used to sell milk in front of their hall. The next kind of milk students usually drink is fermented milk. Fermented milk refers to those milk that has been fermented with lactic acid bacteria such as Lactobacillus, Lactococcus, and Leuconostoc. Around 16.70% of students drink fermented milk. Although powder milk is most popular among the children still the younger people love to drink powder milk. They usually drink powder milk by mixing it up with tea. Around 16.70% of students drink powder milk. Skimmed milk refers to those milk from where all the milkfat has been removed. Around 9.10% of students drink skimmed milk and 7.60% of students drink semi-skimmed milk.

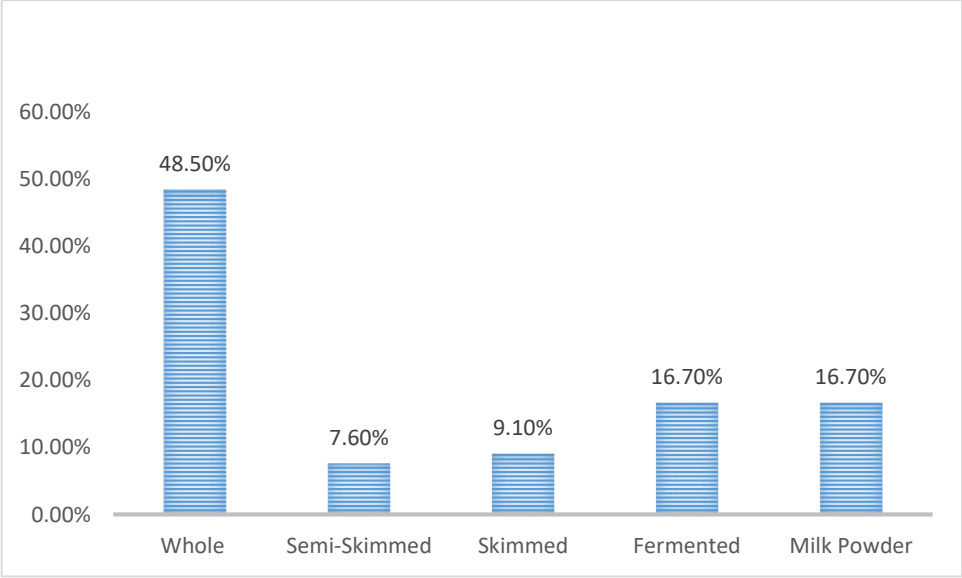

Figure 4. Types of milk respondents consume

4.7. Milk consumption frequency

Table 5. Milk consumption frequency

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	once a month	24	34.3	34.3	34.3
	once per week	13	18.6	18.6	52.9
	three times a week	14	20.0	20.0	72.9
	Daily	11	15.7	15.7	88.6
	twice in a day	8	11.4	11.4	100.0
	Total	70	100.0	100.0	

This milk consumption frequency states how many times a consumer consume 200ml of milk. This study found that around 11.4% of respondents consume twice 200ml milk at breakfast and dinner that represents a small portion of the respondents. Around 15.7% of respondents consume daily 200ml of milk. They show moderately positive attitudes towards pasteurized milk. Around 20% of consumers consume 200ml of milk three times a week. Around 18.6% of consumers consume 200ml milk once in a week. They show a moderately negative consumption frequency. The big portion 34.3% of consumers consume 200ml once in a month. That means they show a negative response towards pasteurized milk. They are not intentional milk consumers rather they are accidental milk consumers.

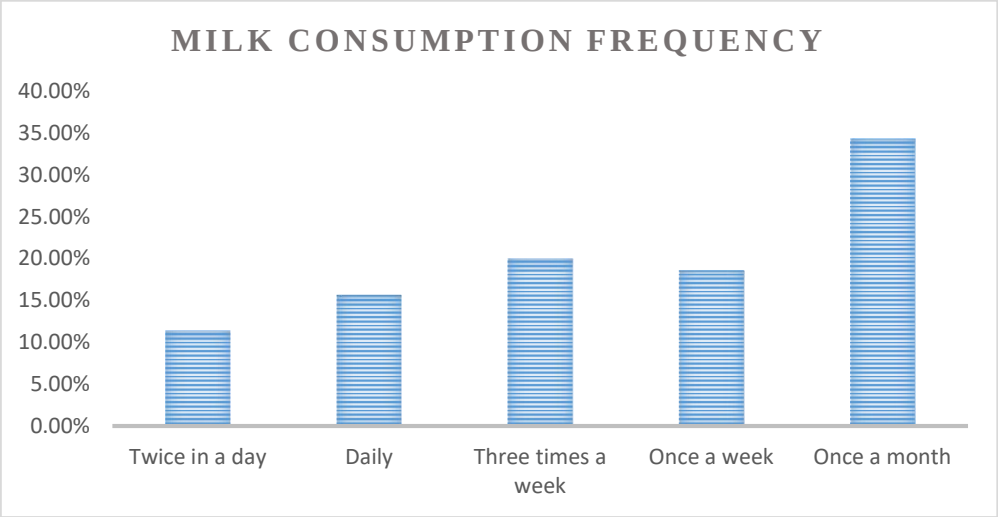

Figure 5. Milk consumption frequency

4.8. Family income category

Table 6. Frequency distribution of income

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	lower income	2	2.9	2.9	2.9

	lower middle income	6	8.6	8.6	11.4
	middle income	7	10.0	10.0	21.4
	\upper middle income	41	58.6	58.6	80.0
	higher income	14	20.0	20.0	100.0
	Total	70	100.0	100.0	

This study is assuming 15000-25000 Taka as the lower-income family. Here only 2.9% of the respondents belong to the lower-income family. Taka 25000-35000 is assuming as the lower-middle-income family. Here 8.6% of the respondents belong to the lower-middle-income family. Taka from 35000-45000 is assuming as the middle-income family. Around 10% of the respondents belong to the lower-middle-income family. Taka from 45000-55000 is assuming as the upper-middle-income family. Most of the respondents that are around 58.6% belongs to this family income category. Those respondents whose family earning more than 55000 BDT belong to the higher income category. Around 20% of respondents belong to this higher-income family.

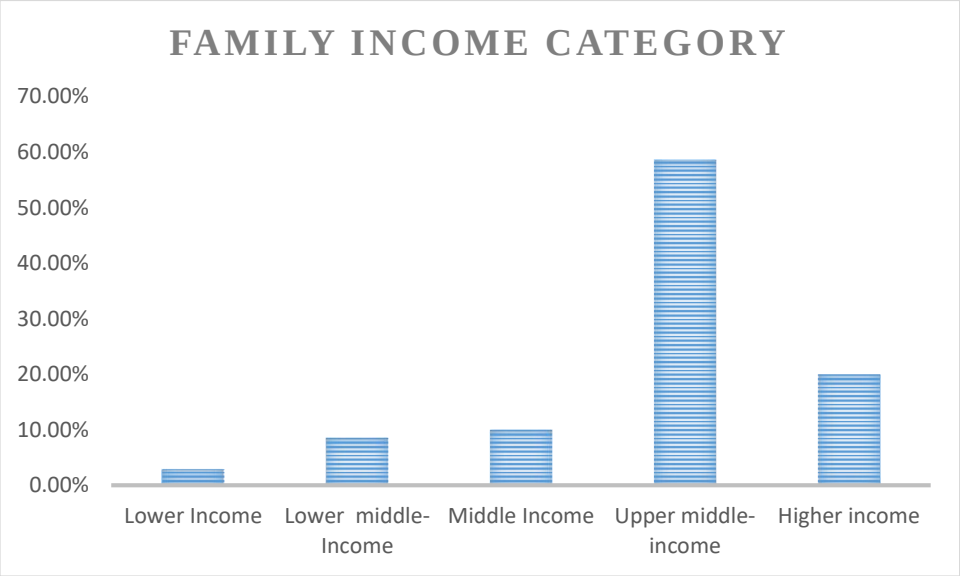

Figure 6. Family income category

4.9. Strength of belief on antibiotic scandal

Table 7. Strength of belief on antibiotic scandal

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	strongly disagree	7	10.0	10.0	10.0

	disagree	3	4.3	4.3	14.3
	neutral	20	28.6	28.6	42.9
	agree	21	30.0	30.0	72.9
	Strongly agree	19	27.1	27.1	100.0
	Total	70	100.0	100.0	

Those who strongly disagree with the report of Professor ABM Faroaue on antibiotic milk scandal has less strength of belief on the report and they continue their milk consumption even though the antibiotics have been found. Around 10% of the respondents strongly disagree with the report. Around 4.3% of the respondents disagree with the statements which means they have no belief in the report. Around 28.6% of the respondents are neutral which means they have no knowledge about the antibiotic scandal or they do not want to show any concern towards it. Around 30% of the respondents agree with the statements and they have believed in the report. They think that the antibiotics have really been found in pasteurized milk. Those who strongly agree with the statements have high strength of belief on the report and they will show negative consumption frequency towards consuming pasteurized milk. This portion represents around 27.1% of the respondents.

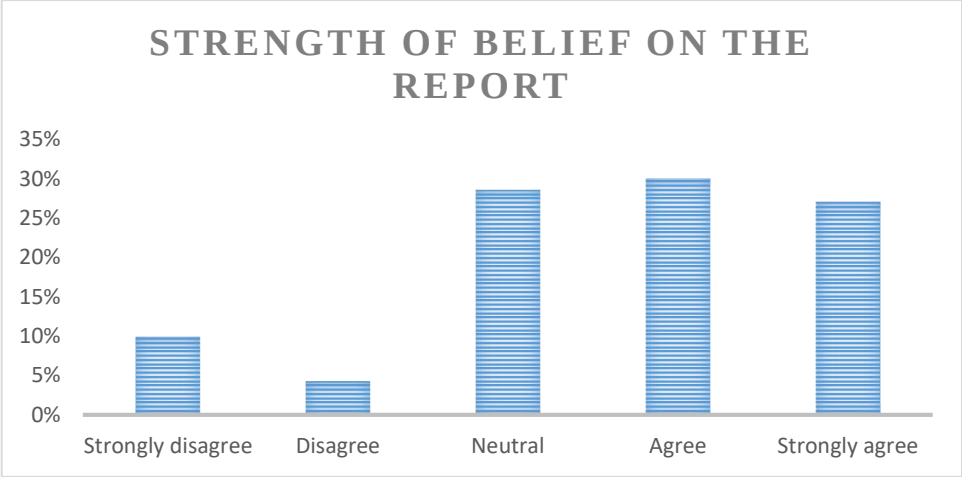

Figure 7. Strength of belief on the report

4.10. Findings

Constant α= 4.52 indicates that even without any income and if no antibiotic scandal occurred the consumption of pasteurized milk will be 4.526

The estimated coefficient of family income variable X_1 ($\beta_{1=}$ -.254) indicates that there is an inverse relationship between the family income category and consumption of pasteurized milk. The value indicates that if a person graduates from one income category to another then milk consumption

decreases by .254 unit. This can happen because the higher income works as proxy variables of the health consciousness and a health-conscious person thinks twice before purchasing pasteurized milk because of recent occurrence.

The estimated coefficient of the strength of belief on antibiotics variable X_2 ($\beta_{2=}$ -.288) indicates that there is a negative correlation between the consumption of pasteurized milk and the strength of belief in this report. Therefore, this result matches our expectation. It can be said that for every level increase in the strength of belief the consumption will decrease by .288 unit.

From the ANOVA table, it could be stated that the null hypothesis is rejected as the value of significance level (.015) is smaller than 0.05. Therefore, this study can say that the recent antibiotic scandal has a great impact on pasteurized milk consumption.

5. Discussions

In a shocking revelation, the Bangladesh Food Safety Authority (BFSA) claims to have lead beyond permissible limits in 11 out of 14 pasteurized milk samples of as many brands, approved by the Bangladesh Standards and Testing Institute (BSTI). The 11 brands are Milk Vita, Dairy Fresh, Igloo, Farm Fresh, Aftab Milk, Ultra Milk, Aarong Dairy, Pran Milk, Ayran, Pura, and Safe (Dhaka Tribune, 16th July 2019). Again another study, conducted by Professor ABM Faroque, former director of the university's Biomedical Research Centre confirmed that all of the milk in the market contained the traces of antibiotics. The researchers collected 10 new samples for testing, among them four samples contained with antibiotics and detergents and the others contained with antibiotics. Confirming the findings, the pharmaceutical technology teacher told, "The same team of researchers, conducted tests on samples of the same milk brands collected from the same place. We also used the same apparatus from the last round of tests (bdnews24.com, 13th July 2019)."

This type of report has a a great impact on the consumption of pasteurized milk. Because people are more health-conscious nowadays especially the educated section of the consumer. They used to take care of what they are consuming. From this literate section, especially the students of the University of Dhaka, This study has tried to measure perception and factors that determine the consumption of pasteurized milk.

To understand the factors that determine the consumption of pasteurized milk This study has selected the two explanatory variables. They are the strength of belief on the antibiotic scandal report and family income category of the individual respondents. This study has tried to regress these explanatory on the dependent variable that is the consumption frequency of the respondents. After analyzing those data

this study has found that the estimated coefficient of family income variable X_1 ($\beta_{1=}$ -.254) indicates that there is an inverse relationship between the family income category and consumption of pasteurized milk. This study is expecting a positive correlation between the family income category and the consumption of pasteurized. Because the higher income indicates the higher purchasing power of the consumers. But the coefficient of the family category variable is negative which indicates that if a person graduates from one income category to another then milk consumption will decrease by .254 unit. This has happened because the higher income of a respondent does not always mean that he/she will purchase more. The Higher-income sometimes works as a proxy variable of health consciousness and obviously, a health-conscious person used to purchase selectively especially those items, which has a direct impact on their health. Another explanatory variable that This study has taken is the strength of belief on the antibiotic scandal report published by DU professor ABM Faroque. This has been taken as an important determining factor because professor Faroque is a public figure and he is a storehouse of trust to the consumer. This study is expecting the more a respondent trusts on the report the less he is going the purchase the pasteurized milk. However, the estimated coefficient of the strength of belief variable X_2 ($\beta_{2=}$ -.288) indicates that there is a negative correlation between the consumption of pasteurized milk and the strength of belief on this report. This value matches our expectations. Thi study can say that for every level increase in the strength of belief on the report the consumption will decrease by .288 unit.

In this research, This study has included two variables to understand the factors affecting the consumption of pasteurized milk. They are the recent antibiotic scandal and the family income category of the respondents. However, it needs to be clarified that the consumption of milk does not depend on only these two variables. There are other variables that can affect the consumption of pasteurized milk of a respondent. They can be health consciousness of the respondents, whether in which condition the milk will consume, the price of the milk, the availability of the milk etc. It was not possible for us to include all the variables within my studies because of the limited time.

6. Conclusion

Milk consumption is one of the basic food habits that a person consumes for proper calcium and phosphorous required for the healthy growth of bones and teeth and it an essential ingredient for the growth and proper functioning of the body. But the recent antibiotic scandal has brought this topic on the lime-light as this has a great impact on the consumption of milk. The purpose of this study was to measure the impact of these factors on the consumption of pasteurized milk. This study will help marketers to understand what factors a consumer consider while purchasing pasteurized milk and what steps they can take to reduce the negative impact of the recent antibiotic scandal. Marketers also can gain proper insight about frequency, types and considering factors about the respondents' consumption

behaviour. Marketers will get to know that the coefficient of family income variable indicates that there is an inverse relationship between the family income category and consumption of pasteurized milk and a negative correlation between the consumption of pasteurized milk and the strength of belief on this report.

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