

**NUTRITIONAL STATUS OF SELECTED CONSTRUCTION
WORKERS IN DINAJPUR DISTRICT**

A THESIS

BY

MONWARUL KABIR BADHON

Registration No. 1805166

Session: 20018-2019

Semester: January-June, 2019

MASTER OF SCIENCE

IN

FOOD SCIENCE AND NUTRITION



**DEPARTMENT OF FOOD SCIENCE AND NUTRITION
HAJEE MOHAMMAD DANESH SCIENCE AND TECHNOLOGY
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In partial fulfillment of the requirements for the degree of

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JUNE, 2019

Dedicated
To
My beloved parents

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The author

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ABSTRACT

Construction site is a booming site for developing countries. The construction workers are helping every day to construct mega structures, infrastructures that helps to develop our country day by day, so their nutrition and safety is very important. The purpose of the non-experimental observational study was to assess nutritional status, lifestyle, socio-economic status, and health problem information of construction workers in Dinajpur district, Bangladesh. A total of 150 construction workers (male 83 and female 51) from Dinajpur (Parbatipur, Fulbari) and Hajee Mohammad Danesh Science and Technology University, M Abdur Rahim Medical College Hospital, Dinajpur in Bangladesh were selected for the study. Face to face interview of the Participants completed to set of a questionnaire containing their lifestyle, socioeconomic status, health-related knowledge and individual Body Mass Index (BMI). The present study found 62% Male and 38% Female worker. From the study, it was found that the majority of the participants had normal weight (61.33%) and limited numbers were overweight (18%). 53.34% worker had complaints of skin problem, back pain, breathing problem. Their nutritional knowledge was limited. For lack of nutritional knowledge and awareness, they were suffering nutritional and health-related problems. The findings provided a further insight on the seriousness of certain types of health problems that affect construction workers working in the construction site. This finding may have implications for formulating proper intervention strategies for the sustainable development of Bangladesh construction working site.

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LIST OF ABBREVIATIONS

BDHS	Bangladesh Demographic and Health Survey
BBS	Bangladesh Bureau of Statistics
BMI	Body Mass Index
Cm	Centimeter
FAO	Food and Agriculture Organization
SPSS	Statistical Package for the Social Science
WHO	World Health Organization
CMH	Commission on Microeconomics and Health
HCES	Household Consumptions and Expenditures Survey

CHAPTER 1

INTRODUCTION

Nutrition is linked with construction worker health, Wellbeing, and productivity improvements. Unhealthy eating may result in reduced immunity, increase proneness to developing chronic diseases, reduce concentration, alertness, and productivity. Improving the nutrition of construction workers is, therefore, a paramount concern. Although it is generally acknowledged that improving nutrition requires an understanding of the factors which influence construction workers "food choices" it has also been shown that the first step in achieving healthy eating is through though increasing nutritional awareness and knowledge which will help in inculcating positive nutritional behavior. The present paper, therefore, aims to highlight the state of nutritional assessment among construction workers and a possible way of increasing nutritional awareness. Proper nutrition is important in improving community health in general and of the risk groups in particular. Balance nutrition can protect against many diseases resulting from nutrient deficiencies or excess. The knowledge of the nutritional status of a community is important for proper planning in the health sector. The nutritional status of a community indicates that whether or not the intakes of the macro and micronutrients are adequate, deficient or in excess. The nutritional status of individuals is determined by anthropometric measurements, comparison of nutrient intakes with reference values or biochemical investigations of nutrients related parameters. The anthropometric measurements, comparison of nutrients intakes with reference values are easy noninvasive, economical sufficiently reliable method for the determination of nutritional status (Godfrey *et al.*, 2004). Balanced nutritional intake is essential for human development and healthy life, thus it should be practiced with every meal. Inadequate intake of nutrients would have a direct effect on both health and performance (Labib *et al.*, 2001).

Malnutrition adversely affects mental development, physical development, productivity, the span if working years all of which significantly influence the economic potential of man (Aln Berg, 2008). On the good nutrition and health of young workers are of vital importance for efficiency, productivity and the health of the newborn. Bangladesh made substantial progress in reducing malnutrition between 1990 and 2000. The study was carried out to assess the nutritional status of medical and to determine its relation to their

lifestyle. The study involved at Shams University revealed that 41.3% of the samples were normal weight, while 9.5% of the samples were underweight. The study concluded that about half were overweight and obese. The most important lifestyle factors responsible for under nutrition. The study focused on the analysis of BMI of the worker and assessment of calories and nutrients intake per sexes for determination of the consumption per foodstuff at the main courses and snacks. The construction industry is a booming industry for developing countries. The rapid development of the construction industry relies on construction productivities, which in turn concerns with health conditions of the construction workers. Construction productivities are very much dependent on the workers' health, adequate nutrition, and industrial discipline because these determine the predictable availability of labor (Thomas & Frankenberg, 2002). The construction sector is highly risky due to its production processes and labor-intensive characteristic. Owing to that, occupational accidents bring the sector up against the large-scale financial loss. Each year in the British construction sector, around 3% of workers suffer from an illness they believed to be work-related and 3% of workers sustain a work-related injury, leading to 1.7 million workings lost days (Health and Safety Executive, 2015). In Turkey, the cost of workday loss caused by major occupational accidents is USD19, 431.75 and minor occupational accidents caused a loss of USD6, 924.25. The costs of workday loss caused by minor occupational accidents are almost 35% of major workday losses (Yilmaz & Çelebi, 2015). These costs elicit the importance of preventive measures for workers' health and safety in construction. In the Malaysian context, a database on construction workers' health statistics is still lacking. Before understanding how does safety and health influence the Bangladeshi construction sector, it is important to first determine the common health issues among construction workers. The findings are believed to be crucially useful in ascertaining the financial analysis for construction companies. Therefore, this paper aims to identify the common health problems among construction workers who are working in the construction environment in Bangladesh. Good nutrition has a positive impact on occupational safety and health as well as workplace productivity (International Labor Organization (ILO, 2009). Unhealthy foods can lead to obesity, chronic diseases and malnutrition which are detrimental to a productive workforce (Yates, 2006; ILO, 2009; World Health Organization (WHO, 2003).

Good nutrition is essential for maximum concentration and alertness required to perform mentally and perpetually demanding tasks, thereby preventing the occurrence of incidents, accidents, injuries and deaths (Bates and Schneider, 2008). Fatigue and impaired concentration or reduced cognitive capabilities, partly as a result of unhealthy eating, can result in accidents and productivity losses (Hunt, 2002; Bates and Schneider, 2008). Research by the ILO found that poor nutrition accounts for up to a 30% impairment of physical work capacity and performance and 20% loss in productivity, and is tied to absenteeism, sickness and higher rates of accidents (Wanjek, 2005).

Furthermore, research has shown that construction workers have poor health, partly due to poor nutrition (Groeneveld *et al.*, 2011; Thabit *et al.*, 2013). Consequently, strategies to combine protection from occupational risks with programs to encourage individual change to diminish health and safety risks from nutrition-related conditions warrant consideration (Schulte *et al.*, 2007). This is especially true for construction workers who are the most valuable resource involved in the process of constructing facilities and who engage in perpetually demanding tasks, and as such, their health, wellbeing, and safety must be assured (Hinze *et al.*, 2013). Their health and safety cannot be assured solely by compliance with existing safety regulations (Hinze *et al.*, 2013).

The first step towards improving nutrition and encouraging behavioral change is through nutritional knowledge and education (Mc Nulty, 2013). According to Grunert *et al.* (2010) and Chenhall (2010), nutritional knowledge encompasses an ability to identify healthiest foods from various sources or knowledge of what a healthy diet means; knowledge of the sources of nutrients; knowledge of the health implications of eating or failing to eat particular foods; and an ability to cook. In the authors' views, equipping individuals with the information necessary to choose healthy foods and the ability to decipher "wrong" foods from "right" foods will ultimately lead to an improvement in diet

1.1 Problem statement

Rates of malnutrition in Bangladesh are among the highest in the world. As an eminent citizen of the society, construction workers should maintain a sound nutritional status. But according to the reports of the various leading newspaper the dining condition and quality of their supplied food of Bangladeshi construction workers are not up to the mark. From the Journal of Surveying, Construction & Property (JSCP), ISSN:1985-7527

and International Journal of Environmental Research & Public Health the construction workers are suffering from malnutrition which is hampering their normal life and flourishing their higher levels of potentiality. Hence the present study was undertaken to explore the present situation of the selected construction workers in Dinajpur district.

1.2 Objectives of the study

- The study aimed to generate socio-economic information about construction workers.
- Find out the information regarding nutritional knowledge of construction workers.
- Gathered health problem information about construction workers.

CHAPTER 2

REVIEW OF LITERATURE

2.1 General Overview of Nutritional Status

Good nutrition has a positive impact on occupational safety and health as well as workplace productivity (International Labor Organization (ILO, 2009). Unhealthy foods can lead to obesity, chronic diseases and malnutrition which are detrimental to a productive workforce (Yates, 2006; ILO, 2009; World Health Organization (WHO, 2003). Literature suggests that construction workers' bad food choices are partly as a result of the predominantly low level of knowledge about the poor nutritional value of the foods they eat regularly (Men's Health Forum (MHF). Likewise, Wanjek (2005) investigated how workers, in general, eat and found that lack of nutritional awareness led to workers rejecting healthy food offering to the extent that vendors refused to provide them anymore because they did not sell.

Another study in the United Kingdom (Men's Health Forum (MHF), 2009) investigated the nutritional habits of construction workers by reviewing existing evidence and speaking with industry stakeholders and construction workers themselves. Findings from this study revealed that construction workers especially male workers generally have less knowledge of particular foods and consume high-fat foods in the belief that this will enable them to undertake a physically-demanding job.

In a literature review of factors influencing the diet and nutrition of blue-collar apprentices in Australia, du Plessis (2012) reviewed previous literature and found that construction workers, especially young male workers have poor nutritional status due to several factors including, inter alia, lack of nutritional knowledge.

Likewise, Viester *et al.* (2012) intimated that blue-collar workers in a Netherlands construction company have some basic knowledge of nutritional standards but they were not aware of their intake levels. This seems to suggest that construction workers may be oblivious of the poor nutritional content of the foods they consume even though they may be somewhat knowledgeable about healthy eating.

The above studies were not conducted in South Africa. Nevertheless, similar research in South Africa expresses the same views. Kolver (2012) stated that many South African

workers are unaware of the poor nutritional value of the foods they eat regularly. Additionally, in a survey on construction contractors' perception of benefits of addressing various health-related concerns including, inter alia, healthy eating,



Deacon and Smallwood (2003) revealed that 61% of the participants were aware of the benefits of nutrition to their safety, 26.8% were unaware and 14.3% disagreed that nutrition is important. Albeit this study was conducted amongst construction contractors and not craft workers, it gives an idea of the opinions of workers in the construction industry regarding the role of healthy eating in preventing accidents and injuries. The study suggests that workers are somewhat aware of the importance of healthy eating. Good nutrition is essential for maximum concentration and alertness required to perform

mentally and perpetually demanding tasks, thereby preventing the occurrence of incidents, accidents, injuries and deaths (Bates and Schneider, 2008). Fatigue and impaired concentration or reduced cognitive capabilities, partly as a result of unhealthy eating, can result in accidents and productivity losses (Hunt, 2002; Bates and Schneider, 2008). Research by the ILO found that poor nutrition accounts for up to a 30% impairment of physical work capacity and performance and 20% loss in productivity, and is tied to absenteeism, sickness and higher rates of accidents (Wanjek, 2005).

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The first step towards improving nutrition and encouraging behavioral change is through nutritional knowledge and education (McNulty, 2013). According to Grunert *et al.* (2010) and Chenhall (2010), nutritional knowledge encompasses an ability to identify healthiest foods from various sources or knowledge of what a healthy diet means; knowledge of the sources of nutrients; knowledge of the health implications of eating or failing to eat particular foods; and an ability to cook. In the authors' views, equipping individuals with the information necessary to choose healthy foods and the ability to decipher "wrong" foods from "right" foods will ultimately lead to an improvement in diet. Nutrition refers to how is processed and utilized by the body for growth, reproduction, and maintenance of health. The food contains different nutrients that include water, carbohydrates, proteins, fats, vitamins, and minerals. Good nutrition is important to ensure survival and that critical functions operate, including; the body producing energy for survival, movement work and temperature control, growth, development, replacement, and repair of cells and tissues, chemical processes such as digestion, metabolism and maintenance and protection against illness, fighting infections and recovery from illness (Sakamaki *et al.*, 2005). Nutritional status is a measure of the health condition of an individual and is affected primarily by the intake of food and the

utilization of nutrients. Despite the importance of nutritional knowledge in improving nutrition and thus health, wellbeing, safety, and productivity of construction workers, it appears that scant research has been conducted on the level of nutritional knowledge amongst construction workers. Previous studies were either too broad (for instance, Deacon and Smallwood (2003) which dealt with health-related aspects of safety including inter alia, nutrition) and conducted amongst construction contractors; or were not conducted in the construction industry (Divakar *et al.*, 2012). The present paper focuses on nutritional awareness amongst construction workers. Malnutrition defines a state when the body does not have enough of the required nutrients (under-nutrition) nor has an excess of required nutrients (over-nutrition) (Miere *et al.*, 2007). Accurate measurement of individual nutritional status is required in clinical practice. Population measures are more important in research. They can be used to describe the nutritional status of the group, to identify population segments at risk for nutrition-related health consequences, and evaluate interventions (Labia *et al.*, 2001). Good eating habit is an essential part of a healthy lifestyle. It helps to prevent civilization diseases keep our body fit. The body mass index (BMI) and eating plan analysis are useful in an individual's nutritional assessment (Nieradko-Iwanicka and borzecki, 2004). The nutritional knowledge and food habits of Chinese university students were examined and compared them with those of other Asian population. The results showed that 80.5% of students had a normal BMI, and 16.6% of students were underweight. The university and college arenas.

The specific objectives of the study are to investigate the level of nutritional awareness amongst construction workers and to identify effectual ways of improving nutritional awareness amongst construction workers. Nutrition refers to how food is processed and utilized by the body for growth, reproduction, and maintenance of health. The food contains different nutrients that include water, carbohydrates, proteins, fats, vitamins, and minerals. Good nutrition is important to ensure survival and that critical functions operate, including; the body producing energy for survival, movement, work, and temperature control, growth, development, replacement, and repair of cells and tissues, chemical processes such as digestion, metabolism and maintenance and protection against illness, fighting infections and recovery from illness (Sakamaki *et al.*, 2005). Nutritional status is a measure of the health condition of an individual and affected primarily by the intake of food and the utilization of nutrients. Malnutrition defines a state when the body does not have enough of the required nutrients (under-nutrition) nor

has an excess of required nutrients (overnutrition) (Miere et al., 2007). Accurate measurement of individual nutritional status is required in clinical practice. Population measures are more important in research. They can be used to desirable nutritional status of the group, to identify populations or population segments at risk for nutrition-related health consequences, and to evaluate interventions. (Labib *et al.*, 2001). Good eating habit is an essential part of a healthy lifestyle. It helps to prevent civilization diseases keep our body fit. The body mass index (BMI) and eating plan analysis are useful in an individual's nutritional assessment (Neiradko-Iwanica and Brozecki, 2004). Mild or moderate under nutrition is enough to affect intellectual performance which is a major determinant of academic achievement because malnutrition is synonymous with growth failure (Bhargava, 2001).

For whatever method that is chosen for the assessment of nutritional status, the data obtained must be compared with reference data to produce an indicator of nutritional status. Ideal methods are sensitive and specific. Unfortunately, it is difficult to achieve both in the assessment of nutritional status. Sensitivity refers to the ability of a technique to correctly identify those affected by a condition (for example, under nutrition) as having that condition. Specificity refers to the ability of a technique to correctly classify normal individuals as having normal nutritional status (Martinez, *et al.*, 2005)

2.2 Energy Requirements and Reference Body Weight.

Dietary energy requirements of a healthy, well-nourished population should allow for maintaining an adequate BMI at the population's usual level of energy expenditure. At the individual level, a normal range of 18.5 to 24.9 kg/m² BMI is generally accepted (WHO, 1995, 2000). At a population level, a median BMI of 21.0 was suggested by the joint WHO/FAO expert consultation on diet, nutrition and the prevention of chronic diseases (WHO/FAO, 2003). Age, gender, height, weight, and BMI are interlinked to the energy and nutrient requirements of individuals. Anthropometric standards for population groups differ from country to country. Each country has to set its reference standards since the height and weight of the population are not equal to another country. The purpose of recommending nutrient requirements help in planning norms for attaining anthropometric reference standards. International organizations WHO, FSAO have proposed reference standards applicable to developing countries. The 95th centile values of weights and heights for given age/gender can be taken to be representative of well-

nourished normal population and considered as standard reference values for India. For children below age 17, the reference body weight is fixed at the median of the range of weight-for-height given by the BMI reference tables (WHO, 2006 AND 2007). For adults and children of age 10 and above, the reference body weight is estimated based on the fifth percentile of the distribution of the BMI (WHO, 1995; 2007)

2.3 Dietary Pattern in Bangladesh

Cereals, largely rice, from the main components of the diet in Bangladesh. The typical diet in Bangladesh is not balanced and remains dominated by a high intake of cereals (Jahan *et al.*, 1998, BBS, 2005; BBS, 2010).

Table 2.1: Average per capita per day food intake (grams) by residence in Bangladesh

Food items	Present consumption (gram per capita per day) as per HIES 2010	Requirements (gram per capita per day) as per BAN-HRDB 2007	Desirable intake (gram per capita per day) as per DDP, 2013
Vegetables	166.1	200	Leaf: 100 Non-leafy: 200
fruits	44.4	100	100
cereals	463.9	375	400
rice	416	350	350
wheat	26	25	50
others	21.9	-	-
pulse	14.3	60	50
potato	70.3	60	100
fish	49.5	55	60
Meat incl. poultry	19	35	40
egg	7.2	15	30
Milk and milk products	33.7	75	130
Cooking oil	20.5	40	30
Condiments and spices	66	20	20
Sugar/molasses	8.4	18	20
Miscellaneous (tea, soft drinks, bread, biscuit, betel nut, betel leaf)	36.5	-	-
protein	66.26	-	-
Calories(k.cal/capita/day)	2318 kcal	2350kcal	2430kcal

Source:

- a. For consumption: report of the household income and expenditure survey 2010 (report published December 2011), Bangladesh Bureau of statistics
- b. For requirement: former BANHRDB 2007 (Present name Bangladesh institute of research and training on applied nutrition, BRITAIN)
- c. Desirable diet for Bangladesh: a desirable dietary intake has been proposed after the evaluation of previous work and current consumption patterns of the population, DDP, 2013, BIRDEM with the support of nutritional food policy capacity strengthening program (NFPCSP), JUNE 2013

Household food consumption studies over the last 15 years have shown the consumption of cereal intake decreases but it still makes up the largest share (70 %) of the diet, followed by non-leafy vegetables, roots, and tubers, which together comprise more than four-fifths of rural peoples total diet (BBS, 2010). Protein and micronutrient-rich foods like fish, meat, eggs, milk products, fats, and oils account for less than 10 % of the rural person's diet, and the consumption of vegetables and fruits are slowly improving over the years. Rural consumption of leafy and non-leafy vegetables has remained more or less the same over the past two decades after increasing over the preceding 30 years. With an average nutritional per capita consumption of 31 g of leafy vegetables, 136g of non-leafy vegetables and 45g of fruit, the average Bangladeshi eats a total of 212g of fruit and vegetables daily (HIES 2010). This is far below the amount of 400g of vegetables and fruit recommended by FAO/WHO in 2003. It is encouraging that the HIES 2010 points towards an increase in vitamin A and iron consumption as compared to HIES 2005 and Bermudez *et al.*, 2012, but it still needs improvements to fulfill the requirements. Besides, cultural norms dictate a better diet for males over females with the male head of the household getting the best meal portions. Persistent poverty, inadequate nutrition information, and gender inequality cause pervasive malnutrition among women, especially pregnant women, and lactating mothers.

2.4 Assessment of nutritional status

A nutritional assessment can be defined as the interpretation of information obtained from anthropometric measurement, biochemical or laboratory tests, clinical indicators, and dietary assessment. This study will focus on anthropometric and dietary techniques. (Mukundi *et al.*, 2000)

2.4.1 Anthropometric assessment

Anthropometry is the measurement of the physical dimensions and composition of the body. (Onis M. *et al.*, 1996). This method can be used to detect the degree of malnutrition in an individual population. To assess the presence or absence of malnutrition, three measurements are taken and they include age, height, and weight. These measurements are used to calculate the major anthropometric indicators of nutritional status namely; weight-for-age, weight-for-height, and height-for-age. These indicators are then compared with those obtained from an international reference population (WHO, 2006). The use of height-for-age and weight-for-height as primary indicators of nutritional status in workers was recommended by a joint board consisting of FAO, and WHO, 2006. 2.5.2 Dietary method low dietary intakes, either due to a primary deficiency (low levels in the diet), a secondary deficiency (interference with ingestion, absorption, transport, utilization or excretion of nutrients), or inadequate food consumption are the first indicator of malnutrition (Lohman *et al.*, 1988), dietary assessment can be done in two ways;

- I. By quantities measurement of recalls or records of consumption at mealtime over one day.
- II. By use of dietary history and the food frequency questionnaire. These two methods obtain retrospective information on the patterns of food consumption during a longer and precisely defined period.

CHAPTER 3

MATERIAL AND METHODS

3.1 Study site

The study was carried out in Dinajpur district (Parbatipur, Fulbari) and Hajee Mohammad Danesh Science and Technology University, Dinajpur in Bangladesh, M Abdur Rahim Medical College Hospital, Dinajpur in Bangladesh.

3.2 Study design and study population

The study population consisted of 150 construction workers in Dinajpur. The worker was grouped as a village area or place basis. All the respondents were both male and female adolescents, adults, Middle Ages and old people in the Dinajpur district.

Here it was included especially root level workers who live with hand to mouth.

3.3 Inclusion criteria

The workers which involve construction site and other construction-related work. The data was collected directly at the working pace and going to the workers home.

3.4 Exclusion criteria

The workers who were not involved with the construction site and other construction-related work were eliminated.

3.5 Structured interview questionnaire

The main instrument was a structured questionnaire which was divided into different sections as per the objectives. A semi-structured questionnaire was used to gather information on the socio-demographic characteristics of the respondents. Information collected included; name, sex, age, education, marital status, monthly income, nutritional knowledge, lifestyle, the anthropometric assessment included: height, weight, BMI.

3.6 Anthropometric tools

Weight was taken using scale name WALTON weight scale and the height was taken by using measuring tape.

3.7 Training of field research assistants

Three field assistants who were well conversant with English and the local language were recruited and trained so that they assist in data collection. The training includes the explanation of objectives of the study, introduction to the survey procedure and the expected duration that the study would take. In addition to that, training on the administration of the questionnaire was as well carried out

3.8 Pre-testing of the study tools

A preliminary trip to the study area of study was taken to familiarize me with the general set up of the area. Relevant authorities were informed about the research project. The appropriateness of the study tools was presented and instruments and also evaluated the recruited field assistants. After the pre-test, appropriate changes were made and corrections in the document were performed before the main study.

3.9 Ethical considerations

All the ethical issues during the study were strictly followed. The ethical consideration included.

3.10 Field ethics

To have a legal ground to undertake the study permission from the contractor of the construction site and the construction engineer. All the tools that are used in this study were noninvasive. All interviews were conducted from their leisure time in working place and from their home. In the interview, the names of the participants were recorded.

3.11 Ethics during the measurement

The purpose and content of the survey team were explained in a non-threatening and culturally acceptable way while providing the listener with an opportunity to ask questions and decline participation if necessary.

3.12 Administration of the questionnaire

A structured questionnaire was especially administered to select the construction worker face to face interview. The questionnaires were administered in Bengali for an easy understanding of the interview. Data that was collected in the questionnaires include;

socio-economic data, anthropometric data, dietary intake. Health problem information, dietary intake. The completeness of the questionnaires was checked before releasing every worker.

3.13 Anthropometric measurements

Anthropometric measurements i.e., height and weight together with the age and sex of the construction workers were collected. Height was obtained by positioning the measuring tape in a vertical position. A barefooted worker was asked to stand straight against the measuring tape while looking straight ahead. With the help of the field assistant, the heels were maintained together and the body position so that the shoulder blades, buttocks and heels were touching the vertical surface of the height scale. The feet were maintained flat on the floor although slightly apart with the back straight and the hands freely hanging on the sides. as he/she stood still, the horizontal headboard was placed lightly but firmly against the head perpendicular to the height measuring tape. The height of each worker was then read to the nearest 0.1 cm at the point where the headboard touched the height measuring tape. Two measurements were taken for each student and the average height computed as the actual height of his/her. Weight was taken using the human body weight scale, which was calibrated in kilograms. The workers were weighed with minimum clothing on and without shoes. Two readings were recorded to the nearest 0.1 kg and their average was taken as his/ her actual weight. The balance was properly checked before any weight was taken. Find out the BMI of subjects was calculated from the body weight in kilograms and height in *meter*² by using the following formula adopted by nutritionists (west, 1990).

$$\text{BMI} = \frac{\text{Weight of the subject in kg}}{(\text{height of the subject in meter})^2}$$

3.14 Weight

Weight was measured with the Walton body weight scale that was kept on a hard horizontal surface. Subjects were asked to wear light cloth and weight was recorded to the nearest 0.5 kg.

3.15 Height

This was measured with tape to the nearest centimeter 0.01 cm. subjects were requested to stand upright without shoes with their back against the wall, heels together and eyes directed forward.

3.16 Body Mass Index

Table 3.1 WHO classified the weight based on their amount.

Category	BMI(Kg/m ²)
Underweight	<18.5
normal	18.5-24.9
overweight	25.0-29.9
Class I obesity	30.0-34.9
Class II obesity	35.0-39.9
Class III obesity	≥40

Source: WHO (1995, 2000 AND 2004)

$$\text{BMI} = \frac{\text{WEIGHT(Kg)}}{\text{HEIGHT(m}^2\text{)}}$$

Obesity was defined as anyone having BMI equal and above 25 kg/m² according to the recommended guidelines for Indians.

3.17 Ideal body weight

IBW of the subject was calculated by using the formula given by Jelliffe (1996)

$$\text{IBW (For men)} = \frac{\text{Height(cm)} \times 400}{1000}$$

$$\text{IBW (For Women)} = \frac{\text{Height(cm)} \times 350}{1000}$$

3.18 Data quality control

Data quality control measures were employed during data collection as follows;

3.18.1 Accuracy of anthropometric measurements

Accuracy of the measurements was achieved through good training and supervision of the field assistants by the principal investigator. During height and weight measurement, two measures were taken on the same worker and the average of the two measures was taken as the actual measurement.

3.18.2 Standardization/calibration of instruments

The scale was calibrated before each weight was taken. Standardization tests were performed every morning period to the fieldwork with known weights to ensure that the scale used was accurate and reliable.

3.18.3 Minimizing biases

To minimize bias and obtain complete and reliable information, the study respondents were informed about the purpose of the research. To avoid observer bias and assure the viability of anthropometric measurements, two readings were taken the completed questionnaires were cross-checked for completeness of data, consistency of answers and measurements obtained and for the correct filling of the questions. Any errors identified were corrected. After data entry, data cleaning was done to ensure that data had been entered correctly on the computer.

3.19 Data processing and analysis

Data from the completed questionnaires and anthropometric measures were put, cleaned and analyzed using SPSS/PC version 19 statistical software. Anthropometric data were converted into nutritional indices. Chi-square tests were employed to test for proportionality differences in the study distribution. Association/correlations were also done for continuous variables.

CHAPTER 4

RESULTS

4.1 Distribution of socio-demographic characteristics of the respondents

The socio-demographic characteristics of the respondents are shown in table 4.1. Among the study subjects, 62% were male while 38% were female. The age of 35.34 % of construction workers was in the range of 26-30 years. Their maximum educational level is primary passed (69.33%). Their family types were nuclear (50.67%). maximum workers were only one income way (88%).

Table 4.1 Distribution of socio-demographic characteristics of the respondents

		frequency	Percentage (%)
Sex	Male	93	62
	Female	57	38
Age(y)	15-20	19	12.66
	21-25	50	33.34
	26-30	53	35.34
	31-35	13	8.66
	36-40	09	6
	41-45	06	4
Educational qualifications	primary	104	69.33
	Lower secondary	20	13.33
	secondary	08	5.34
	Higher secondary	00	00
	illiterate	18	12
Family type	nuclear	76	50.67
	extended	58	38.67
	others	16	10.66
Source of income	One	132	88
	more	18	12
Income	Bellow 9999	12	8
	10000-14999	120	80
	15000-19999	18	12

4.2 Demographic profile of the study population

The study covered the construction workers in Dinajpur district out of whom 62% (n=93) were male and 38% (n=57) were female. The workers were selected in Dinajpur district discontinuously. A total of 150 construction workers were divided into six age groups where 19 were found 20-29 years' age range. 50 were found 21-25 years old. 53 were found 26-30 years old. 13 were found 31-35 years old. 09 were found 36-40 years old. 06 were found 41-45 years old.

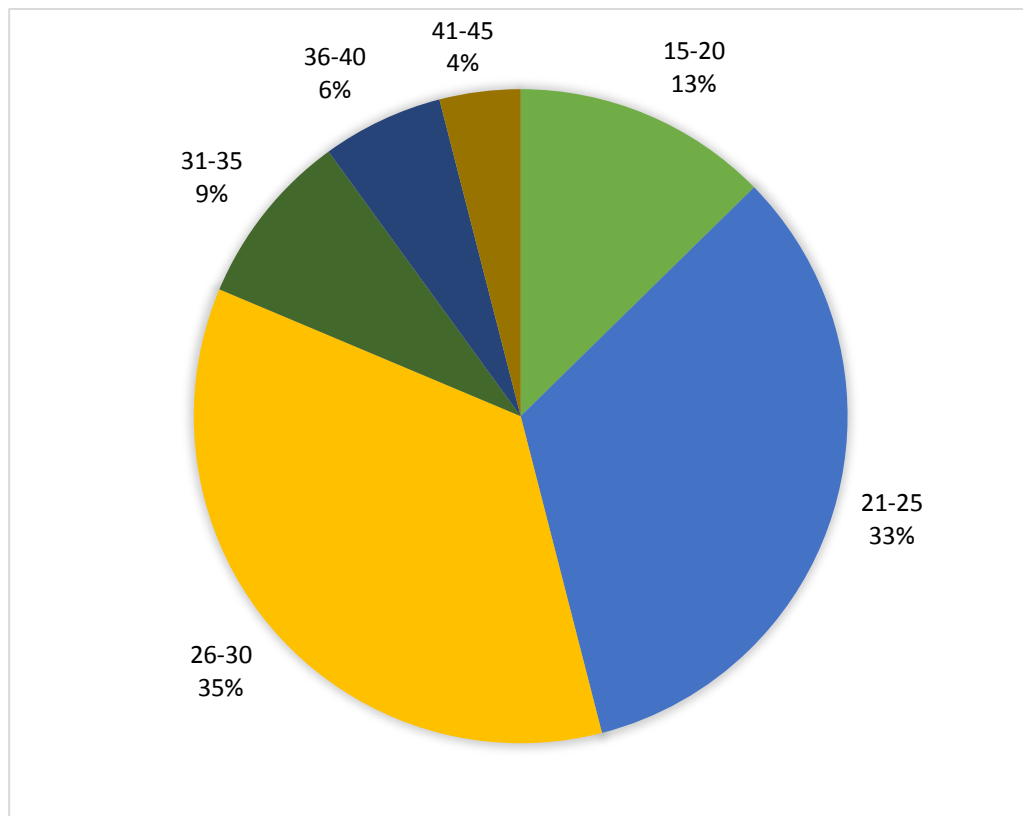


Figure 4.1: Demographic profile of the study population

4.3 Nutritional status of different age groups

The anthropometric measurements of construction workers are described in table 4.3. It was observed that 20.67% (n=31) respondents were underweight, 61.33% (n=92) respondents were normal weight, 18% (n=27) were overweight. The prevalence of underweight is higher than overweight. In this study, underweight and overweight were 20.67 % and 18 % respectively.

Table 4.2 Nutritional status of different age groups

		BMI Category			
		Underweight	normal	Overweight	Obese
15-20	frequency	6	11	2	0
	% within the age group	31.57	57.89	10.52	0
21-25	frequency	10	33	7	0
	% within the age group	20	66	14	00
26-30	frequency	11	30	12	00
	% within the age group	20.75	56.60	22.64	00
31-35	frequency	3	9	1	00
	% within the age group	23.07	69.23	7.69	00
36-40	frequency	1	5	3	00
	% within the age group	11.11	55.55	33.34	00
41-45	frequency	0	4	2	00
	% within the age group	00	66.66	33.34	00
	Total frequency	31	92	27	00
	Total % within the age group	20.67	61.33	18	00

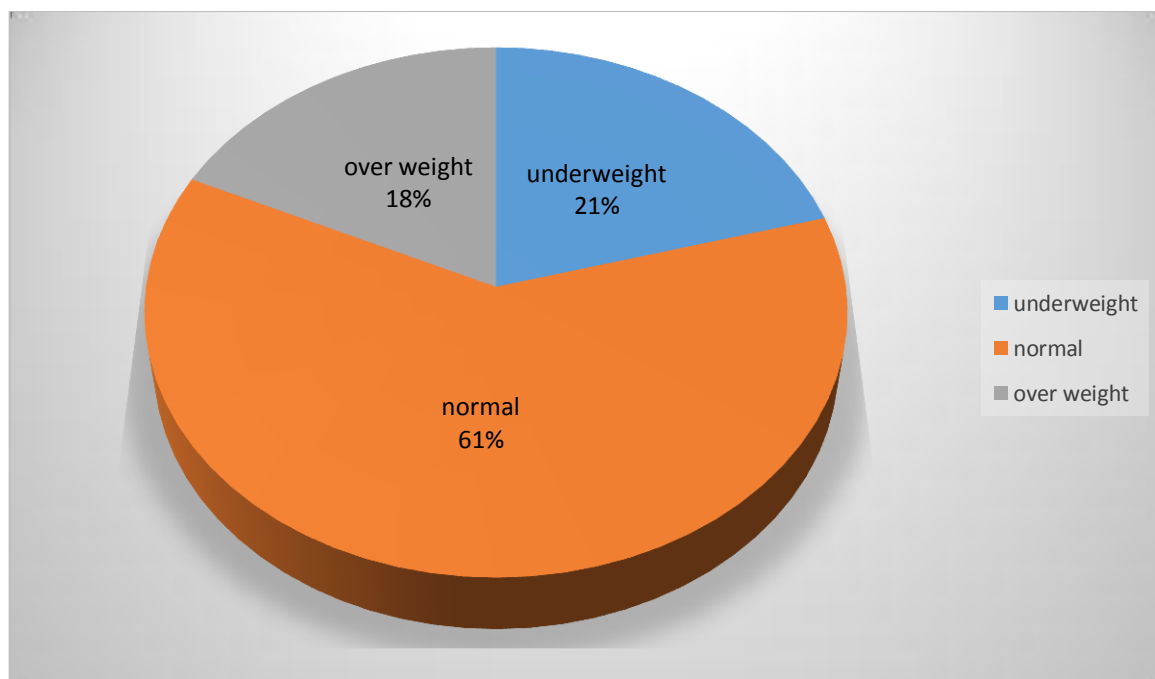


Figure 4.2: Nutritional status of the study population.

4.4 Number of taking meals per day

The construction workers should need more energy and water. But at the maximum, they were not eating food more than three times, because they were not provided another more time for taking a meal and they didn't want to spend more cost for a meal. In this study, 80% (n=120) of construction workers had taken a meal three times. They had taken their meals three times along with high carbohydrates.

Table 4.3 Number of taking meal/day

Number of meal/day	frequency	Percentage (%)
2 times	17	11.34
3 times	120	80
4 times	08	5.33
Others	05	3.33

4.5 Health problem information

Here in this study, 53.34 % (n=80) of construction workers were suffering from such types of skin problem especially their hands and their legs skin problem.

Table 4.4 Health problem information

		Frequency	Percentage (%)
Suffering from skin disease	yes	80	53.34
Suffering from skin disease	no	70	46.66

4.6 Using safety aid

In health problem information the maximum number (80%) construction workers were using inappropriate safety aid while 20% were using perfect safety aid.

Table 4.5 Using safety aid

		frequency	Percentage (%)
Using appropriate safety aid	yes	30	20
Using alternatives	yes	120	80

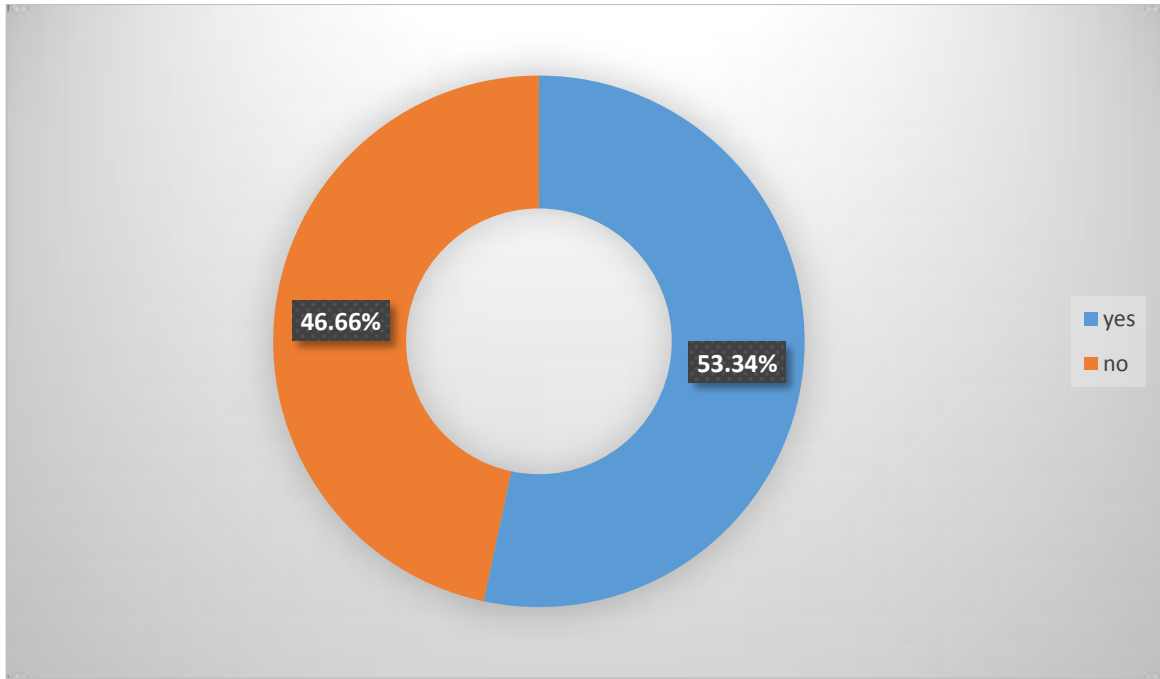


Fig 4.3: Suffering from skin disease percentage

In health problem analysis the construction workers were suffering from skin problems (53.34%) while no skin problem percentages were 46.66%. These problems they were carrying for no use safety aid which will protect them from any skin problem furthermore it can occur from nutritional deficiency.

4.7 Addiction percentage

From 150 construction workers, the study found 73.34% (n=110) were a smoker or other addicts were 26.66 % (n=40) were no smoker or another addict. Here the maximum number of the worker involved with smoking or other addiction.

Table 4.6 Addiction percentage

	Frequency	Percentage (%)
Smoking or other addiction	110	73.34%
No smoking or no other addiction	40	26.66%

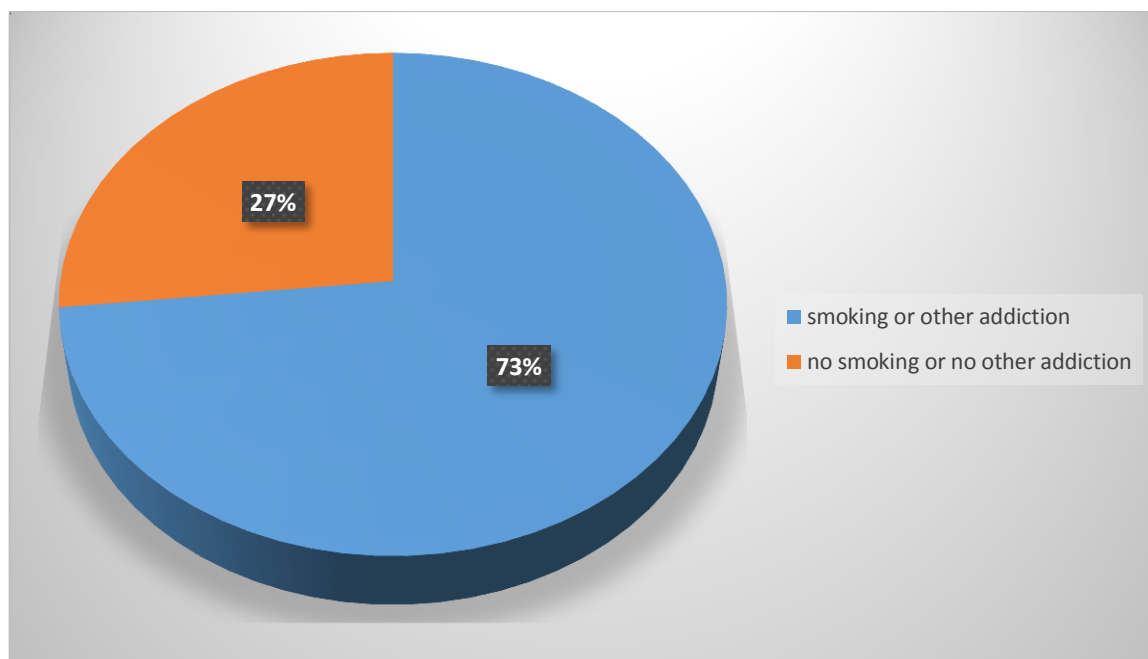


Fig 4.4: Smoking or other addiction percentage

4.8 Nutritional knowledge of construction workers

To know the nutritional knowledge, a total of 150 construction workers had asked 10 nutrition-related questions (both male and female) for testing their nutritional knowledge. The questions answer had divided into four categories; low (5<), very low (3<), high (5>) and nil (0).

Table 4.7 Nutritional knowledge of construction workers

Nutritional knowledge	Low (less than 5 answers out of 10 questions)	Very low (less than 3 answers out of 10 questions)	High (getter than 5 answers out of 10 questions)	Nil (00)
frequency	6	12	0	132
Percentage (%)	4	8	0	80

The nutritional knowledge of the construction workers in the Dinajpur district is described on the table. It was observed that 80 % (n=132) workers had no idea about nutrition where 4% and 8 % were ignorable.

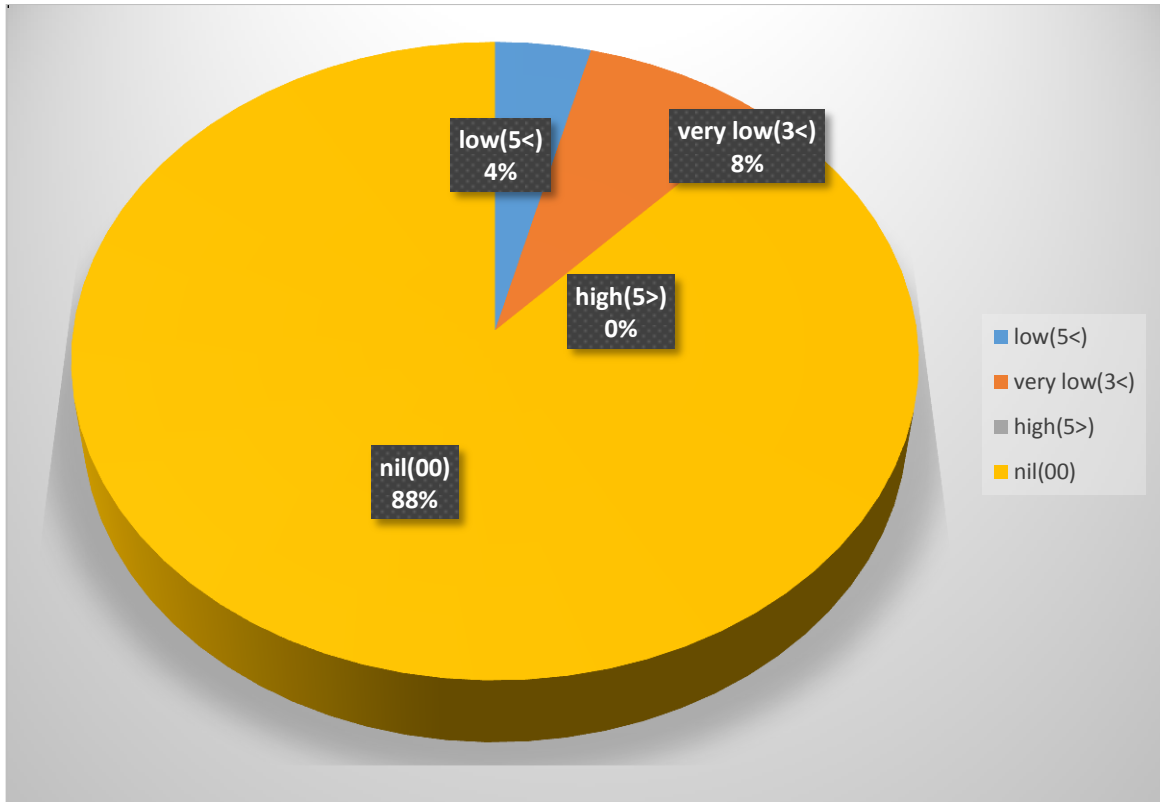


Fig 4.5: Nutritional knowledge of construction workers

CHAPTER 5

DISCUSSION

The study showed that maximum workers were adult (both male and female). About 35.34 % of construction workers were 26-30 years old, 12.66% of workers were 15-20 years old. There were 6% of workers involved with 34-40 years old. There was no worker found below 15 years old. So child labor wasn't found in this study. Here child labor and older aged workers were absent, because in these age, may be the persons couldn't afford the heavy work.

Their educational qualifications were insufficient among construction workers. About 69.33% of workers (n=104) were in primary educated and 13.33 % (n=20) were lower secondary passed. In Dinajpur education is spread everywhere but there is a lack of knowledge about the importance of education and inadequate financial support of construction workers in Dinajpur. Maximally they were from the nuclear family (50.67%, n=76). Their lifestyle was not so comfortable. The maximum number of workers was only one income source and the maximum worker's income range was 10000-14999 taka.

The study also includes construction workers BMI percentage. The study shows that the underweight percentage is higher (20.67%) than the overweight percentage (18%). But maximum participants body weight was normal (61.33%). Because they were heavy worker. They burn all calories to do work all day long.

Maximum workers were taking their meals three times per day with high carbohydrates because their body needs more energy. In this study, the construction workers were facing health problem and they are not aware of safety, which is published in Journal of Surveying, construction & Property (JSCP), ISSN: 1985-7527. That is similar findings in this study. About 53.34% (n=80) workers were suffering from skin related problems, especially their hands and legs. It had held for lack of awareness about health. They were not using appropriate safety aid. About 80% (n=120) respondents were using alternatives safety aids that did not effectively work. In this research the maximum construction workers involved with smoking or other addiction. 73.34 % (n=110) of workers were in this problem (addiction). The nutritional knowledge of construction workers in the Dinajpur district was insufficient. Maximum number of workers (80%) hadn't any

nutritional knowledge. Because they weren't provided adequate training about that. They didn't know which food contain more nutrients but low in cost. So they were not able to consume these to maintain nutritional balance.

CHAPTER 6

CONCLUSION

The construction workers are facing many problems like financial, physical and nutritional problems. We need to counsel them to give up smoking or other addiction which is harmful to their health. We should improve awareness about their safety and health. There is more lack of knowledge about nutrition among them. So the policymaker in our country and our government should take different programs, training facilities to develop their nutritional knowledge and health awareness.

REFERENCES

- Ahamed F, Zareen M, Khan M, Banu ,Haq M, Jackson A. 1998. Dietary pattern, nutrient intake And the growth of adolescent school girls in urban Bangladesh: Public Health Nutr, 1998.
- Alhojailan, M. I. (2012). Thematic Analysis: A critical review of its process and evaluation. *WEI International European Academic Conference Proceedings*. October 14-17, Zagreb, Croatia.
- Bakr EM, Ismail NA, Mahaba HM. 2002. Impact of lifestyle on the nutritional status of medical students at Aim Shams University. *J. Egypt Public Health Association*. 77(1-2):29-49.
- Bates, G. P., and Schneider, J. (2008). Hydration status and physiological workload of UAE construction workers: A prospective longitudinal observational study. *Journal of Occupational Medicine and Toxicology*, 3(21).
- BBS. 2011. Report on the household income & expenditure survey 2010.
- BDHS. 2007. Bangladesh Demographic and Health Survey, NIPORT, Dhaka, Bangladesh.
- BDHS. 2011. Bangladesh Demographic and Health Survey, NIPORT, Dhaka, Bangladesh.
- Bermudez O. I., Lividini K., Smitz M. F., Fiedler J. L. 2012. “Estimating micronutrient intakes From household consumptions and expenditures survey (HCES): An example from Bangladesh”. *Food nutr. Bull.* 33(3): S208-S213.
- Bermudez OI, Livindini K, Smitz MF, Fiedler JL. 2012. Estimating micronutrient intakes from Household consumptions and expenditures survey (HCES): An example from Bangladesh. *Food Nutr Bull* 33 (3): S208-S213.
- Bhargava A. 2001. Nutrition Health and ECONOMIC Development some policy priorities. Commission on Microeconomics and Health (CMH). Working paper series, paper no.EGI: 14, 2002.22 (2): 173

- Chenhall, C. (2010). Improving cooking and food preparation skills: A synthesis of the evidence to inform program and policy development. *Health Canada*. Canada: North America.
- Choi C. 1999. Studies on nutrient intake and food habits on college students in tagu. Korean. *J. Nutr.* 32 (8): 918-926.
- Contento I. R. 2008. “Nutritional Education: Linking theory, research, and practice”. *Asia Pac. J. Clin. Nutr.* 17:176-17
- Contento, I. R. (2011). Nutrition education: Linking research, theory, and practice. (2nd ed.). Sudbury, MA; Jones and Bartlett.
- Divakar, S., Prema, L and Kumar, C. E. A. (2012). Health and nutritional knowledge assessment scale for workers in the cashew industry. *Journal of Human Ecology*, 37(3):185-188.
- Du Plessis, K. (2012). Factors influencing Australian construction apprentices’ dietary behaviors. *American Journal of Men’s Health*, 6(1):59-66.
- FAO. 1997. Human Nutrition in the developing world, Food and Agriculture Organization of the United Nations. Rome: 283.
- Godfrey Km, Barker DJ. 200. Fetal nutrition and adult disease. *The American journal of clinical Nutrition*. 71(9): 1344s-1352.
- Graaf DE. 2006. Effects of snacks on energy intake an evolutionary perspective. 47:18-23.
- Groeneveld, I. F., van der Beek, A. J. Proper, K. I., Hildebrandt, V. H. and van Mechelen, W. (2011). Short and long-term effects of a lifestyle intervention for construction workers at risk for cardiovascular disease: A randomized controlled trial. *BMC Public Health*, 11:836.
- Grunert, K. G., Wills, J. M., Fernandez-Celemin, L. (2010). Nutrition knowledge and use and understanding of nutrition information on food labels among consumers in the United Kingdom. *Appetite*, 5:045.

- Habicht, J., Pelto, G. H. and Lapp, J. (2009). Methodologies to evaluate the impact of large-scale nutrition projects. World Bank.
- Hales C. H., Barker D. J. P. 2001. "The thrifty phenotype hypothesis". *Brit Med Bull.* 60:51-67.
- Hales CH, Barker DJP. 2001. The thrifty phenotype hypothesis. *Brit Med Bull.* 60:51-67.
- Harding JE. 2001. The nutritional basis of the fetal origins of adult disease. *Int. J Epidemiology.*
- Hinze, J., Godfrey, R. and Sullivan, J. (2013). Integration of construction workers safety and health in the assessment of sustainable construction. *Journal of Construction Engineering and Management*, 139: 594-600.
- Hunt, J. M ()2002). Reversing productivity losses from iron deficiency: The economic case. *Journal of Nutrition.*294S-801S.
- International Labour Organization (ILO). (2009). ILO standards on occupational safety and health: Promoting a safe and healthy working environment. ILO Conference (98th session) Report III (Part 1B).1st ed. International Labour Office, Geneva.
- Iriyama Y. and Murayama, N. (2014). Effects of a worksite weight-control program in obese male workers: A randomized controlled crossover trial. *Health Education Journal*, 73(3):247-261.
- Irvine, A. B., Ary, D. V., Grove, D. A. and Gilfillan-Morton, L. (2004). The effectiveness of an interactive multimedia program to influence eating habits. *Health Education Research*, 19(3):290-305.
- Jahan K., Hossain M. 1998. "Nature and extent of malnutrition in Bangladesh: Bangladesh National union survey 1995-96". *Dhaka: Institute of Nutrition and Food Science, University of Dhaka.* P.33.
- Jonna- Szymelfejnik E, Lidia W, Roman C. 2008. Magnesium, zinc and copper intake by polish University students. *Pak. K. Nutr.* 7:436-443.

- Kim, S.H., J.Y. Kim and C.L. Keen, 2005. Comparison of dietary patterns and nutrient intake of Elementary children in a remote rural area in Korea. *Nutr.Res.*25:349-363.
- Kolver, L. (2012). Employers realizing the importance of adequate nutrition. *Mining Weekly*. Creamer Media: South Africa.
- L. Kathleen Mahan and Sylvia ESCOTT-Stump. 2016. "*Krauses Food, Nutrition and Diet Therapy (14 Th Ed.)*. W. B. Saunders, Philadelphia.
- Labib F. A., Rasswan N. m., Abou-El- magd A. 2001. "The influence of parent's education and occupation on nutritional status in Education College in Ismailia". *The Med. J. of Cairo Univ.* Vol.9.No. 1.
- Labib FA, Rashwan NM, Abu-El- magd, A. 2001. The influence of parents education and Occupation on nutritional status in Education College in Ismailia. *The Med. J. of Cairo Univ.* Vol. 9.No. 1.
- Lang I., Galloway T. AND Scarlett A. 2008. A Concentration with Medical Disorders and Laboratory Abnormalities in Adult, Association of Urinary Bispherol, *JAMA*, 300(II): 1303-10.
- Lohman T., Roche A., Martorell A. 1988. Anthropometric standization reference manual. *Cham. Paignil. Human Kinetics Books. Pp.863-710*.
- Lohman, T, Roche A, Martorell A. 1988. Anthropometric standardization reference manual. Cham. Paignil. Human Kinetics Books.pp. 863-710.
- Lucas A. 1991. Programming by early nutrition in man. In: *The Childhood Environment and Adult Disease*.pp.38-55.
- Luccas A. 1991. Programming by early nutrition in man. In: *the Childhood Environment and Adult Disease*. Pp. 38-55.
- Martinez RC, Veiga HP, Lopez A, Cobo JM, Carbajal AA. 2005. Nutritional status assessment in a Group of university students employing parameters and body composition. *Nutr. Hosp.*, May-June. 20(3): 197-203.

- McNulty, J. (2013). Challenges and issues in nutrition. Background paper for International Conference on Nutrition Rome: Nutrition Education and Consumer Awareness Group, Food and Agriculture Organization of the United Nations.
- Men's Health Forum (MHF). (2009). Beyond the greasy spoon: Improving the diet of male construction workers. *Foods Standards Agency*. The United Kingdom.
- Miere D., FiLip L., Indrei L., Soriano J. m., Molto J. c. and Manes J. 2007. "Nutritional assessment of the students from two European University centers". *Rev. Med. Chir. Soc. Med. Nat.* 111 (1): 270-275.
- Nieradko-Iwanicka B., Borzecki A. 2004. Nutritional assessment and eating habits analysis in young adults. *Ann. Univ. Mariae. Curie. Sklodowska.* 59(2): 437-440.
- Onis MD, Onyango A, Borghi E, Siyam A, Nishida C, Siekmann J.2007. Development of a WHO Growth reference for school-aged children and adolescents, *Bull World Health Organ*, vol. 85.pp.660-7.
- Sakamaki R., Toyama K., Amamoto R., Liu C. J., Shinfuku N. 2005. "Nutritional knowledge, food habits and health attitude of Chinese university students- a cross-sectional study ".*Nutr.j.*,pp.44-67.
- Schulte, P. A., Wagner, G. R., Ostry, A., Blanciforti, L. A., Cutlip, R. G., Krajnak, K. M., Luster, M., Munson, A. E., O'Callaghan, J. P., Parks, C. G., Simeonova, P. P. and Miller, D. B. (2007). Work, obesity and occupational safety and health.*American Journal of Public Health*, 97(3):428-436.
- Society for Nutrition Education and Behaviour. (2013). Three "hands-on" classes are enough to impact health behaviors in lower-income women. *Science Daily*. 7 November. Available from www.sciencedaily.com/releases/2013/11/13110709383.htm>.Accessed 24 July 2015.
- Soederberg Miller, L. M., and Cassady, D. L. Making healthy food choices using nutrition facts panels: The roles of knowledge, motivation, dietary modifications, goals and age. *Appetite*, 59(1):129-139.

- Thabit, H., Burns, N., Shah, S., Brema, I., Crowley, V., Finnegan, F., Daly, B. and Nolan, J. J. (2013). Prevalence and predictors of diabetes and cardiometabolic risk among construction workers in Ireland: The construction workers health trust screening study. *Diabetes and Vascular Disease Research*, 10(4):337-345.
- Thomas M. S. 2005. "Relationship between dietary fiber composition in food and glyceamic index". *America Journal of nutrition*.pp.72-75.
- Viester, L., Verhagen, E. A. L. M., Proper, K. I., van Dongen, J. M., Bongers, P. M., and van der Beek, A. J. (2012). VIP in construction: Systematic development and evaluation of a multifaceted health program aiming to improve physical activity levels and dietary patterns among construction workers. *BMC Public Health*, 12:89.
- Wanjek, C. (2005). *The food at work: Workplace solutions for malnutrition, obesity, and chronic diseases*. International Labour Organization (ILO): Geneva.
- WHO (2003). *Diet, Nutrition and prevention of chronic diseases*. WHO technical report series. WHO, Geneva
- WHO. 2003. *Diet, nutrition and the prevention of chronic diseases*. Geneva, World Health Organization.
- WHO. 2007. *Protein and amino acid requirements in human nutrition*. Report of a Joint WHO/FAO/UNU Expert Consultation, United Nations University, WHO Technical Report Series 935. World Health Organization.
- WHO. 2011. *Non-Communicable Disease risk factor survey Bangladesh 2010*.
- WHO. 2014. *Non-Communicable Disease (NCD) country profiles*.
- WHO.1997. WHO Technical report series No. 724. Geneva. *Obesity, preventing and managing the global epidemic*. Report of World Health Organization Consultation of obesity, 3-5 June, Geneva.
- WHO.2002. *The world health report: Reducing Risks, promoting healthy life*. World Health The organization, Geneva. Pp14-26.

WHO/FAO. 2004. "Promoting fruit and vegetable consumption around the world". *A joint meeting of WHO/FAO on fruits and vegetables for health improvement Kobe, Japan.*

WHO/FAO. 2004. Human vitamin and mineral requirements: Report of a Joint FAO/WHO Expert consultation, Bangkok, Thailand, FAO.

Yates, J. K. (2006). Global engineering and construction. John Wiley and Sons.

APPENDIX
NUTRITIONAL STATUS OF SELECTED CONSTRUCTION
WORKERS IN DINAJPUR DISTRICT

A. Identification of labor

Sample code;

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name	sex	religion	Age(y)	Marital status
	1. Male 2. Female 3. others	1. Islam 2. Hindu 3. Buddhist 4. Christian 5. others		1. singal 2. double 3. divorced 4. widow
Level of education	1. primary	2. secondary	3. higher secondary	4. others

B. socio-economic information

1. What is the type of your family?

=

1. nuclear family	2. extended family	3. others
-------------------	--------------------	-----------

2. Who is the chief earning member of your family?

=

If you are not	If you
----------------	--------

3. What is the monthly income of chief earning member in your family?

=

4. How many members of your sister and brother?

= sister

=brother

5. How many earning member in your family?

=

6. what is your father`s occupation?

=

3. What is your total monthly income?

=

4. How amount your children are?

=

5. Does your wife/husband do any work?

=

6. If yes, how amount she/ he earn per month?

=

7. Do your children go to school?

=

8. Do your children (if earning) help you to provide money?

=

Occupation code	8. govt. service
1. farmer	9. teacher
2. day labor	10. doctor
3. tenant farmer	11. potter
4. vendor/trader/fisherman	12. blacksmith
5. businessman	13. non-govt. service
6. driver	14. unemployed
7. housewife	15. others

7. what is your father`s monthly income?

=

8. what is your mother`s occupation?

=

Occupation code	8. govt. service
1. farmer	9. teacher
2. day labor	10. doctor
3. tenant farmer	11. potter
4. vendor/trader/fisherman	12. blacksmith
5. businessman	13. non-govt. service
6. driver	14. unemployed
7. housewife	15. others

9. What is your mother's monthly income?

=

10. Who bears your cost?

=

11. What is the amount of land in your family? (For all)

=

1.Dowelling land.....decimal
2.Cultivable land.....decimal
3.Uncultivable land.....decimal
4.No land

12. What is the type of your home? (For all)

=

1.Own	2.Tenant	3.Others
-------	----------	----------

B. Life style

1. How much money do you provide in your family?

=

2. Do you use the internet?

=

3. Monthly cost.....

a. What is your expenditure on buying clothes?

=

b. What is your expenditure on eating purposes?

=

c. What is your expenditure for medical purpose?

=

d. What is your expenditure for a cell phone (if used)?

=

e. What is your expenditure on internet cost?

=

f. What is your expenditure on transportation costs?

=

g. What is your expenditure on other costs?

=

4. Where do you take your food at a working time?

=

1. Outside hotel food	2. Carrying homemade food	3.others
-----------------------	---------------------------	----------

D. Health problem information

1. Do you know your blood group?

=1. Yes

2. No

2. Have you ever taken any vaccine for hepatitis-B?

=1. Yes

2. No

3. Did you suffer any sickness at the last six months?

=1. Yes

2. No

4. If yes, is the type of sickness?

=

<u>Disease code.</u> 1.fever 2.penumonia 3.diarrhoea 4.dysentery 5.ulcer	6.hepatitis 7.malariae 8.heart disease 9.diabatics 10.skin disease	11.sexual disease 12.bone pain 13 respiratory disease 14. kidney disease 15.dental problem 16. others
---	--	--

5. Which method of treatment you have taken?

=

Treatment code.

- 1.allopathiy
2. homeopathy
3. ayurbadhy
4. kobiraji
5. own method
6. nothing

6. Where have you taken treatment?

=

Treatment taken code.

- | | |
|--------------------|-------------|
| 1. Medical Centre | 4. Pharmacy |
| 2. govt. medical | 5. nothing |
| 3. Private medical | 6. Others |

7. Was this any treatment available or not?

=1. Yes

2. No

8. Are you satisfied with the treatment?

=

1. Partially
2. Completely
3. Not at all

9. Are you feeling all right now?

=

1. Partially
2. Completely
3. Not at all

10. Are you still suffering from those disease?

=

1.kidney disease	2. liver disease	3. azma or respiratory disease	4. skin disease
------------------	------------------	--------------------------------	-----------------

11. What do you do for your safety?

=

E. Nutritional knowledge

1. Do you know about a balanced diet?

=

1. Partially 2. Completely 3. Not at all
--

2. How many carbohydrates should be taken in a balance diet?

=

1. 20-30% 2. 45-65% 3. Don't know

3. Do you know about anemia?

=1. Yes

2. No

4. Which disease is involved with iron deficiency?

=

1. Anemia 2. Fever 3. Weakness 4. Don't know

5. Do you know some iron-containing food?

=

6. Who is risky with iron deficiency disorder?

=

- | |
|--|
| <ol style="list-style-type: none">1. Adolescent girl2. Adult woman3. Adolescent boy4. Adult man5. Pregnant woman6. Baby7. No one |
|--|

7. What is the reference value of hemoglobin in human blood?

=

- | | |
|----------------|---------------|
| 1. 12-18 mg/dl | 2. 18-24mg/dl |
|----------------|---------------|

8. Do you know some vitamin-c containing food?

=

9. Which disease is involved with vitamin-c?

=

- | |
|---|
| <ol style="list-style-type: none">1. anemia2. scurvy3. don't know |
|---|

10. How much water should be drunk commonly in a day?

=

- | |
|---|
| <ol style="list-style-type: none">1. 2 liter2. 3 liter3. 4 liter4. Don't know. |
|---|

11. How many hours do you spend in heavy work?

=

- | |
|--|
| <ol style="list-style-type: none">1. 6 hours2. 10 hours3. 12 hours4. Don't know |
|--|

12. How many times do you consume your meal in a day?

=

1. 4times	2. 3 times
3. 2 times	4. 1 times
	5. others

13. How often do you have breakfast?

=

1. Always
2. Often
3. Sometime
4. never

14. Do you consume tobacco?

=

1. yes
2. no
3. sometimes

15. How many cigarettes do you consume in a day?

=

16. Do you intake fruit regularly?

=1. Yes 2. No

17. Do you eat vegetables regularly?

=1. Yes 2. No

18. How many times you consume protein (fish/meat/, egg) in a week?

=

1. 2 times
2. 3 times
3. more

19. Do you consume milk regularly?

=1. Yes

2. No

F. Anthropometric assessment.

✓ Height.....cm

✓ Weight.....kg

✓ BMI.....