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A Comparative Study of a Clinical Predication Effects for an Ordinal Outcome: A Study of Clinical Signs of Fast Food Intake for Student between 10-19 Years

دراسة مقارنة للتنبؤ السريري بتأثير النتائج الترتيبية: دراسة الأعراض السريرية لتناول الاطعمة السريعة على التلاميذ ما بين 10 – 19 سنة

A thesis submitted to department of statistics – for requirement the degree for master of statistics

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الآية

قال تعالى:

﴿يَا أَيُّهَا الَّذِينَ آمَنُوا كُلُوا مِن طَيِّبَاتِ مَا رَزَقْنَاكُمْ وَاشْكُرُوا لِلَّهِ إِن

كُنتُمْ إِيَّاهُ تَعْبُدُونَ﴾

صدق الله العظيم

سورة البقرة الاية (172)

DEDICATION

TO my parents

TO my family

&

TO my teachers and friends

TO all Children and their parents in with love and respect

Acknowledgement

I would like to express my special appreciation and thanks to my Supervisor Dr. Al Taiyb Ahmed, both of you have been a tremendous mentor for me. I would like to thank you for encouraging my research and for allowing me to grow as a research scientist. Your advice on both research as well as on my career have been priceless. I would also like to thank my committee members, Professor Dr/Prof: **Husam Mohammed** Dr/Prof **Alrazi Ahmed** Dr/Prof **Altaiyb Omer Ahmed**, for serving as my committee members even at hardship. I also want to thank you for letting my defence be an enjoyable moment, and for your brilliant comments and suggestions, thanks to you. I therefore, would also immensely grateful thanks to students of schools and administrations of this schools in Omdurman states for their helping in filling questionnaire questions.

At the end I would like express special thanks to my parent. Words cannot express how grateful for all the sacrifices that they made on my behalf. their prayer for me was what sustained me thus far. I would also like to thank all my friends who supported me in writing and invited me to strive towards my goal.

ABSTRACT

The research deal with study of the clinical signs of junk food intake for child between 10-19 years in Omdurman locality during (October 2018 to December 2019).Using chi- square test. Applied on 384 students.

The basic problem of this research is the quantity consumption of junk food and it side effect, obesity and academic result, social and economic effects. Statistical packages used for analysis was “SPSS” that calculated and find the relationship of main reasons that caused by junk food. Chi-square distributions used to make this relation reality, cross-tabulation also needed to know how often junk size affect which get from the population sample after study, however, the statistical tools were appeared significant in dealing with data and provided more appropriate results that well described junk food situation.

The most important finding: There is strongly relationship between taken junk food and academic level of students, the parent's education is affect in selected of kind of food and there is no differences between gender (boy – girl) and food frequency in some kind like breakfast, lunch, eggs, dairy products, vegetables and salad this means boy or girl has no preferred all food frequencies mentioned, but has highly significant in dinner. Fool (bush), Tamea, burger, hotdog, pizza, Andome, potato chips, fruits, chips and related, sweets (chocolate – cake). This means the boys is eaten this type of foods differently from eaten by girls.

According to this finding the study recommended Awareness on Health Education at Primary and secondary Schools , health education should be made a part of the school curriculum. Regular workshops and seminars from health specialists/experts would have a great impact in reducing the consumption of junk food to great extent. Establishing early awareness educational programmes aimed at children between the ages of 2 – 18 will

educate about the adverse medical effects and complications associated with fast food induced obesity, and promote active physical activity that is supported by the government for a longer duration.

المستخلص

يتعامل البحث مع دراسة العلامات السريرية لتناول الوجبات السريعة علي التلاميذ بين 10 و 19 عامًا في محلية أم درمان خلال (أكتوبر 2018 إلى ديسمبر 2019). استخدم اختبار كاي . طبقت الدراسة على 384 طالب.

المشكلة الأساسية لهذا البحث هي استهلاك كمية الوجبات السريعة وتأثيرها الجانبي علي السمنة والنتيجة الأكاديمية والآثار الاجتماعية والاقتصادية. كانت الحزم الإحصائية المستخدمة للتحليل هي "SPSS" التي حسبت وأوجدت علاقة الأسباب الرئيسية التي تسببها الوجبات السريعة. استخدمت توزيعات كاي "Chi-square" لجعل هذه العلاقة حقيقة واقعة ، هناك حاجة أيضًا إلى وضع جدول تقاطعي لمعرفة عدد المرات التي يؤثر فيها حجم الوجبة السريعة على عينة السكان بعد الدراسة ، إلا أن الأدوات الإحصائية كانت مهمة في التعامل مع البيانات وقدمت نتائج أكثر ملائمة والتي وصفتحالةالوجبات السريعة جيداً.

النتيجة الأكثر أهمية: هناك علاقة قوية بين الوجبات السريعة التي يتم تناولها والمستوى الأكاديمي للطلاب ، حيث يؤثر تعليم الوالدين في اختيار أنواع الطعام ، ولا توجد فروق بين الجنس (فتى - فتاة) في تناول عدد من الوجبات في وجبتي الفطور والغداء مثلالبيض ومنتجات الألبان والخضروات والسلطة، لكن يوجد اختلاف مهم بين الجنسين لهذه الأطعمة المكورة في وجبة العشاء ، أما الأطعمة مثل:فول (بوش) ، طعمية ، برجر ، هوت دوج ، بيتزا ، و أندومي ، رقائق البطاطس ، فواكه ، شيبس وما يتصل بها ، حلويات (شوكولاتة - كيك) يوجد خلاف في تفضيلها بين الأولاد والبنات، هذا يعني أن الأولاد يأكلون هذا النوع من الأطعمة بشكل مختلف عن تلك التي تأكلها الفتيات.

وفقًا لهذا الاستنتاج ، أوصت الدراسة بالتوعية الصحية في المدارس الابتدائية والثانوية ، ويجب أن يكون التعليم الصحي جزءًا من المناهج الدراسية. سيكون لورش العمل والندوات المنتظمة من المتخصصين / الخبراء الصحيين تأثير كبير في تقليل استهلاك الوجبات السريعة إلى حد كبير. من شأن إنشاء برامج تثقيفية للتوعية المبكرة تستهدف الأطفال الذين تتراوح أعمارهم بين 2 و 18 عامًا أن يقوم بالتثقيف بشأن الآثار والمضاعفات الطبية الضارة المرتبطة بالسمنة الناجمة عن الوجبات السريعة ، وتعزيز النشاط البدني النشط الذي تدعمه الحكومة لفترة أطول.

TABLE OF CONTENTS

LIST of TABLES

LIST of FIGURES

LIST of Abbreviations

BMI	Body Mass Index
CDC	The Centre for Disease Control and Prevention
CNS	Central Nervous System.
DHA	Docosahexaenoic acid
EPA	Eicosapentaenoic acid
EU	European Union
GPA	General point average
IGF	Insulin Like Growth Factor
IGFBP	Insulin Like Growth Factor Binding Proteins
MG	Methylglyoxal
NHL	Non-Hodgkin lymphoma
PEM	protein-energy-malnutrition (PEM)
PUFAs	Polyunsaturated fatty acids
SHBG	Sex Hormone Binding Globulin
WHO	World Health organization

Chapter one

Preface

Research problem

Research importance

Research objective

Research Hypothesis

Methodology

Limitation

Previous studies

Introduction

(1.1) Preface:-

Fast food or junk food is the term given to food that can be prepared and served very quickly. Fast food can also be defined as any food that contributes little or no nutrient value to the diet, but instead provides excess calories and fat. Fast food can be a good way to save time, but it is not the proper way for nutrition. Some of these foods that are of little nutritional value and often high in fat, sugar, and calories. Common foods include salted snack foods, gum, candy, sweet desserts, fried fast food, and carbonated beverages. Fast food may include chips, hot pies, pasties, sandwiches, burgers, croissants, kebabs, pizzas, chicken, soups, and salads. It also includes drinks, for instance, milkshakes, and soft drinks. The medical disadvantages associated with fast food. Fast food is often filled with ingredients such as soya, salt, cheese or mayonnaise and is often deep fried, which adds a lot of extra calories without adding any additional nutrition. Given the high amount of calories, it will take a significant amount of exercise to burn off the calories you take in. Consuming this high level of calories without burning them off can lead to additional health issues. The high levels of sugar and fat in fast food can lead to an increased risk of obesity. It has been shown that those who live close to fast food restaurants have a much higher tendency to be obese. The cooking oils and preservatives used to maintain fast food products make it difficult for your body to shed fat, making hard to shed the extra calories even if you attempt to up your activity level. Though it is not as frequently discussed, liver damage is a significant risk associated with consuming fast food. Junk food is often filled with trans-fat, an artificial fat that is used as a stabilizer so premade foods can sit for long periods of time before they are consumed. As your body works to remove this fat from your system it can build up in the liver and cause damage. This is very similar to the damage which is caused by regularly consuming alcohol. If this is not kept in check it can lead to liver

failure. Regularly consuming fast food that is high in sodium and cholesterol can cause damage to the cardiovascular system. Cholesterol can clog the arteries, increasing the risk of having a heart attack or stroke. High levels of sodium from fries, sodas or enriched meat products will increase your blood pressure, which can also increase the risk of heart attack or stroke over time. As your cardiovascular system is weakened it can be difficult to perform physical activities that will allow you to maintain your health. In addition to the medical disadvantages associated with fast food, the production and selling of junk food puts a significant negative impact on the environment. Besides physical consequences, obesity can also lead to social and psychological problems. Overweight or obese children display lower self-esteem. Obese adolescent females demonstrated significantly lower levels of self-esteem, which led to sadness, loneliness, and high-risk behaviours, such as smoking or alcohol consumption .Also the relationship between nutrition and mental performance in children is important regarding their attainment and productivity both in school and in later life. To date, there is a growing body of evidence that diet might influence the development and functioning of the brain which in turn has an effect on mental performance as a functional outcome, especially when the brain is still developing during childhood and early adolescence. A diet containing too many ingredients that are detrimental in excess or lacking essential nutrients is likely to have adverse consequences for mental outcomes whereas a balanced diet is important for physical wellbeing and mental health, with implications for school performance.

(1.2) Research problem:-

Junk food spread in our schools and becomes the main food for schools students. Junk food leads to obesity which increases the risk for high cholesterol and fatty Development, which translates into greater risk for cardiovascular disease , liver damage is a significant risk associated with

consuming fast food, dense sugar content can cause dental cavities and type 2 diabetes mellitus also effect on the academic level and social consequences.

(1-3) Research importance:-

The prevalence of junk food in schools and society lead to many problems for students such as obesity, Weight gain ,Diabetes , Heart diseases , Cancer , cognitive performance and Social and psychological problems. And we need to reflect this problem to ministry of education, ministry of health so as to make solutions for this problem.

(1.4) Research objective:-

1- To evaluate relationship between types of meals eaten by students and demographics characteristics (grade).

2- To evaluate relationship between types of meals eaten by students and demographics characteristics (gender).

3- To evaluate relationship between types of meals eaten by students and demographics characteristics (academic level).

5-To evaluate relationship between types of meals eaten by students and demographics characteristics (type of schools).

6- To evaluate relationship between drinking held by students and parents education level.

7-To evaluate relationship between parent's education level and knowledge of junk food.

8- To evaluate relationship between parent's education level and activities.

(1-5) Research Hypothesis-

1- There is a significance between types of meals eaten by students and grade.

2- There is a significance in types of meals eaten by students and gender.

3- There is a significance in types of meals eaten by students and academic level.

4- There is a significance between types of meals eaten by students and types of school.

5- There is a significance between types of drinking held by students and parents educational.

6- There is a significance between parent's educational and knowledge of junk food.

7- There is a significance between parent's educational in select kind of food and the impact of activities due to take meal.

(1-6) Methodology:-

Study design:-

Descriptive study.

Study area:-

We classified schools in three types:- governmental schools , private schools and international schools. All these schools are in Omdurman locality. In governmental schools we took four schools Omdurman Al Ahlia model school for boys ,AsmaAbdarahim model school for girls ,Mohammed Husseen public school for boys and Al Shengiety public school for girls for private schools we selected king fahad school for boys , Al Nokhba school for girls , Idris school for boys and Al Motafawigoun school. For international schools we selected Saint goerge schools for boys and girls, Omdur schools for boys and girls, Steeps schools for boys and girls and Keibeda schools for boys and girls

Study population:-

All the students in this study are at the age between 10-19 years old.

Study variables:-

We selected many variables such as age, gender, academic level, parents educational level, types of junk food and beverages and physical activities. .

Sample size:-

384 questionnaires.

Method of data collection:-

Using direct questionnaire to obtain data from the students in the aged 10-19 years.

Technique used:-

Analyse information by statistics chi-square test.

Results and interpretation:-

The results recorded in the questionnaire express all students in this study eat junk food. Then they expose to all side effects of junk food.

Data analysis:-

Data was analysed using statistical package for the social science (SPSS).

Data presentation:-

Presented in form of tables and diagrams.

Data storage:-

The data was stored on personal computer and compact disk.

Ethical consideration:-

All the collected data will be secured to protect the privacy ,maintains confidential and will be used for research purpose only.

(1-7) Limitation:-

Collecting of data by questionnaire takes time three weeks from 21 January to 10 February in Omdurman locality.

(1-8) Previous studies:-

1-Chery D.fryar M.S.ph and R.Bethene Ervin, Ph.D.(2007-2010).Caloric intake from fast food among adults. Tool: SAS. Result: The percentage of calories consumed from fast food

differ by race, ethnicity and income. Recommend:- increase in obesity rate remains un clear.

2-John Reily ,PoukineM.Emmett.(2005).Early life risk for obesity in childhood .Tool: Multivariable binary logistic regression models .Result: Eight factors in early life are associated with an increased risk of obesity in childhood. Recommended: That children in grades one – 12 be taught about the dangers of obesity.

3-Kayla Naticchioni, John Carroll.(2013).The Relationship between Obesity and Academic Achievement of School-Age Children. Result: Estimate the effect of junk food on Academic Achievement of School. Recommended: helping teens get healthy through mind fullness, nutrition and physical activity.

Chapter two

Introduction

What is a Junk Food

Appealing nature of junk food

Recognising junk food

Health impact of junk foods

Junk foods Effects on children's health

Effect of junk Food and Beverages

Obesity

Weight Gain

Diabetes

Heart Disease

High Blood Pressure

Cancer

Cognitive performance

Social and psychological problems

2.1 Introduction:-

Eat healthy and live healthy is one of the essential requirements for long life. Unfortunately, today's world has been adapted to a system of consumption of foods which has several adverse effects on health. Lifestyle changes has compelled us so much that one has so little time to really think what we are eating is right! Globalisation and urbanisation have greatly affected one's eating habits and forced many people to consume fancy and high calorie fast foods, popularly known as Junk foods. Research into the possible health hazards on consumption of such high calorie foods has given an insight to avoid them, but unfortunately measures taken are not as effective as they need to be. Diseases like coronary artery disease and diabetes mellitus have seen a profound rise in developing countries and such unhealthy junk food consumption is one of the notable factors to its contribution. This global problem of consuming junk food on a large scale and its impact on health needs emphasis and health education which can greatly contribute to its limited consumption and witching over to healthy eating habits for the better living. Knowledge highlighting about the eating habits, nutritional aspects, and quality of unhealthy foods, their health impact and preventive measures should be given to create awareness and render health education for a change towards good eating practices. Junk food and its impact on health have been reviewed from various resources and have been systematically presented, so as to emphasize its ill effects and measures to be adapted towards healthy living. Concepts, relationships, lifestyles are changed to include the new jet age and eating habits too is no exception (Solomons NW, Gross R, 1995). Healthy nutritious foods have been replaced by the new food mantra (junk food). In the context of world economy, junk food is a global phenomenon (Holmboe, Ottesen G, 2000). It seems to have engulfed every age; every race and the newest entrants on stage are children, school going in particular. The

way in which we eat, and what we eat, is of vital importance to our state of health.

2.2 What is a Junk Food:-

Junk food simply means an empty calorie food. An empty calorie food is a high calorie or calorie rich food which lacks in micronutrients such as vitamins, minerals, or amino acids, and fibre but has high energy (calories).These foods don.t contain the nutrients that your body needs to stay healthy. Hence, these foods that has poor nutritional value is considered unhealthy and may be called as junk food. Junk food is an informal term applied to some foods which are perceived to have little or no nutritional value, but which also have ingredients considered unhealthy when eaten regularly, or to those considered unhealthy to consume at all(Prof. Suresh Misra ,et al.,206). The term .junk food. was coined as a slang in the public interest in 1972 by Michael Jacobson, Director of the Centre for Science, Washington D.C (Brendan O.Neill, 2006). What makes these foods to be called as .Junk.is that it contains high levels of refined sugar, white flour, trans fat and polyunsaturated fat, salt, and numerous food additives such as monosodium and glutamate at the same time it is lacking in proteins, vitamins, essential minerals, fibre, among other healthy attributes. These foods have little enzyme producing vitamins and minerals and but contain high level of calories in their place. A food that is high in fat, sodium, and/or sugar and provides high calories yet useless in value is generally known as a junk food. On the contrary, junk food is easy to carry, purchase and consume. Generally, a junk food is given a very attractive appearance by adding food additives and colours to enhance flavour, texture and for increasing long shelf life.

2.3 Appealing nature of junk food:-

Junk food comprises of anything that is quick, tasty, convenient and fashionable. Clever junk food advertising and taste attract people to junk food addiction. Following factors generally makes it appealing:-

1. Time factor: Junk food addiction is so high because of its simplicity. They are easy to prepare and ready to consume within no time.

2. Taste factor: Great taste also, is another important reason to select junk food.

3. Attractiveness: Packing of such foods has very attractive appearance by adding food additives and colours in addition to enhancement in flavour.

4. Ad factor: Advertising has a major role in attracting the public, particularly children and adolescents to the junk food selling joints.(Dixon HG, et al..,2005)

2.4 Recognising junk food:-

Junk food, like many other things, can often be known only when you see it. One can spot what might be junk food by looking at a food label (Anderson JW, Patterson K 2005). including that it has little nutritional value and has:

. > 35% of calories from fat (except for low-fat milk)

. > 10% of calories from saturated fats . Any trans fat

. > 35% of calories from sugar, unless it is made with 100% fruit and no added sugar

. > 200 calories per servings for snacks.

. > 200 mg per serving for sodium (salt) for snacks.

. > 480 mg per serving for sodium (salt) for initial meal

Also the ingredients list of the food can be checked to spot many forms of junk food. In general, if one of the first two ingredients is either oil or a form of sugar, then it is likely a junk food. The presence of high fructose corn syrup in the ingredients is also often a tip-off to a food being a junk food (Fister K, 2005).

2.5 Health impact of junk foods:-

Junk food allows people to eat without planning. Eat not only when it is pre-set meal time, but also when they have spare time. Ingredients of junk foods give great taste and make them addictive (Allamani A , 2007) . Fat and sugar in combination are capable of producing a pleasure in people with a propensity for addictive behaviour. On the other side, it must be noted that they are hazardous to health too. High fat content, particularly cholesterol, sugar and salts have their adverse effects on health. high calorie content with sugar can lead to obesity(Bandini LG, et al..,1999) .Dense sugar content can cause dental cavities and type 2 diabetes mellitus (Nisar N, et al..,2009).A short-term adverse effect as a result of eating junk foods lack of energy. Which occurs because junk foods don.t provide essential nutrients, even though they can be very much sufficing, due to which one feels weakened. Unfortunately, meals consisting of junk food don.t fill up for long. Because they are lacking in fibre, and are made of processed foods, they are rated high on the glycaemic index, which means they provide a quick rise in blood sugar, but this also falls quickly, and giving rise to hunger. Cholesterol and salt are known to setoff blood pressure, stroke and heart diseases. Excessive salts can affect functioning of kidneys too. Excess fats and oils along with spices added in these foods act as an irritant to gastric mucosa leading to excess secretion of hydrochloric acid, landing in gastritis. Poor concentration is another result of junk food habit known to affect in immediate and medium term periods. When a junk meal rich in oil is taken, there is a feeling of drowsiness and failure to concentrate. The junk food eating for long period of time can drop blood circulation due to fat accumulation. Lack of vital oxygen, nutrients and proteins particularly can weak the brain cells temporarily. Most of the times these junk foods contain colours, which are often inedible, carcinogenic and harmful to the body. Flavourings and colourings can be allergic causing asthma, rashes and hyperactivity. (Bayol SA, et al.., 2009) .

2.6 Junk foods Effects on children's health:-

Wafers, chips, colas, pizzas and burgers are suddenly the most attractive food items among children. Children rapidly seem to have stepped into a world of fast foods, totally unaware of the damage they are creating for themselves and their impact on their health. Good nutrition is a priority for children at the time of steady growth between the ages of 6. 12 years (Zhu SP, et al.., 2008). Eating habits in such age group not only has an impact on their growth but also on their concentration, feeling and behaviour. The commonest scenario noticed in most homes is a child who returns from school hangs himself in front of the television, faithfully accompanied by a bowl of wafers, a packet of chips and a can of cola (A.B Harrins and G.V.Robbins). Such nutritionally weak foods become quickly addictive and can sow the seeds of infirmity and debilitating disease, which ultimately leads to many an incurable disease. School days are full of educational challenges that require long attention spans and stamina. Poor nutritional habits can weak these pre-requisites of learning, the strength that children need for making friends, interacting with family, participating in sports and games or simply feeling good about them. Nutritionists agree that the reason for kids with attention Deficit, hyperactivity disorder due to kind of food children eat(A.B Harrins and G.V.Robbins ,2012) . Experts warn that eating too much junk food is one of the factors that have contributed to the current childhood obesity epidemic. 90% of parents agree that junk food advertisements were making it difficult for them to promote healthy eating at home. Hence every individual parent in the society need to be educated about such foods and their impact on their children's health, who can take care to avoid them intelligently and keeping them out of the reach of their children. (ScaglioniS, et al..,2008) .

2.7 Effect Of junk Food and Beverages:-

Eating junk food causes.

1- Obesity

2-Weight gain

3- Diabetes

4- Heart diseases

5-Cancer.

6- Cognitive performance

7- Social and psychological problems.

2.8 Obesity:-

The World Health Organization estimates that 1.2 billion people are overweight, and 300 million of them are obese (Government Office for Science 2007) (Kirstine Hansen, et al., 2010). The definition of obesity is based on Body Mass Index (BMI)[which is body weight (kg]: height (m^2] .If BMI $\geq$30.0 kg/m^2 is defined as obesity, BMI between 25.0 and 29.9 kg/m^2 is specified as overweight (Table 1). The prevalence of obesity and overweight in children, adolescents, and adults has increased considerably over previous decades mostly in industrialized countries, and in the future a further growing is predicted. According to estimates by the World Health Organization (WHO), 1.6 billion adults over the age of 15 and 20 million children (age <5) were overweight, as obese adults were 400 million in2005. In addition to this, in April 2007, the International Association provided the information for the Study of Obesity overweight adults in the EU were approximately 40-50% of men and 25-35% women, and an appendage 15-25% of men and 15-25% of women were obese. This is why obesity is one of the most important health issues in the developed world and also in many developing countries (Melissa , İskender 2015) . Childhood obesity affects lives in various ways with serious consequences to a person's health, including immediate and long-term health effects. Some complications of childhood obesity include

cardiovascular disease, such as high cholesterol or blood pressure; prediabetes, which indicates off-balanced blood glucose levels and can result in diabetes; and bone and joint problems, including flat feet, sleep apnea, asthma, gallstones, and polycystic ovarian syndrome (Ebbeling et al., 2002). In addition to those short-term health effects, obesity is associated with an increased risk for long-term health effects, including heart disease, type 2 diabetes, strokes, osteoarthritis, and many types of cancer (CDC) (Kayla ,2013). The effects of junk food include nutritional deficiencies, obesity, increased cholesterol levels, cardiac problems and many other threatening health hazards. Most of these quick and convenient meals contain high amount of sodium, which increases and aggravates the risks of high blood pressure. According to the recommendations of the National Research Council of the National Academy of Sciences 1,200 - 1,500 mg of sodium is the daily sodium requirement for adults. Although the body requires minimum quantities of sodium, too much sodium contributes to high blood pressure. Sodium can also lead to building-up of fluids in case of people who are suffering from people with congestive heart failure, cirrhosis, or kidney disease. Fast food is loaded with calories from refined sugar and fats The fat in human body increases. The increase fat is dangerous for heart .Another issue in the fast food industry is the health hazards that fast food chains are prone to. A particular hazard is the E-coli bacteria that meat products are susceptible to. Because of the long supply chain through which fast food chains operate in, the handling and sourcing of the meat is very hard to monitor. Eating fast food and leading a sedentary lifestyle leads to obesity. Obesity leads to other complications like increase in the cholesterol level, blocking of the arteries, the increased risk of coronary diseases, in addition to the general physical discomfort posed by the extra weight. In short the study showed that life style pattern like family history, minimum physical activity, long duration of screen time, snacking during screen time, dining outside very

frequently and sleep pattern of the child do contribute to childhood obesity. Dietary habits like frequent consumption of deep fat fried fleshy foods; fast food consumption and soft drinks consumption play a vital role in increasing the number of obese children. Genetic factors can also have an effect on the likelihood of becoming overweight or obese; however, the increase in the prevalence of obesity in comparison with the stability of the general populations indicates that the change is mostly environmental (Ebbeling et al., 2002). Childhood obesity may be credited to several environmental changes. The increase in obesity has paralleled the increase in consumption of soft drinks, especially in adolescents. More than half of all adolescents consume soft drinks daily, which amounts to an additional 36 to 57 grams of sugar daily for each additional soft drink. Children and adolescents who consume more than one additional soft drink daily potentially increase their caloric intake by hundreds. Researchers have found a statistically significant link between becoming obese and consumption of sweetened drinks on a daily basis (Ludwig, Peterson, & Gortmaker, 2001). In addition to food consumption and nutrition, physical activity is a major factor in an individual's weight; as levels of physical activity decrease, the risk of becoming obese increases. Research indicates that children with low motor skills also seem to have higher rates of childhood obesity. As students grow older, their level of physical activity has a positive correlation with GPA. This means that as their amount of physical activity increases, their GPA increases; conversely, as their level of physical activity decreases, their GPA also decreases (Kantomaa et al., 2013). Students who have lower levels of physical activity are more likely to be obese; students who have lower levels of physical activity are also more likely to have lower GPAs. Although no causal relationship has been established, another connection between weight and academic outcomes seems apparent. In addition to academic skills, research has shown links between weight status and social and emotional skills and

beliefs. For instance, girls who were overweight or obese not only were significantly more likely to score lower on math and reading tests, but they also had struggles related to social and emotional behaviours (Datar& Sturm, 2006). These overweight females struggled to interpret and thus communicate their feelings appropriately as well as connect with their peers. Obese adolescents also face social consequences in addition to academic ones. Although an important area to examine in its own right, social and emotional skills and behaviours contribute to the way children learn in the classroom. According to a study of seventh to 12th graders, obese adolescents struggled both academically and socially, receiving lower GPAs. Adolescents at risk of obesity struggled to connect with peers, in particularly those of the opposite sex (Crosnoe& Muller, 2004).In addition to social problems, obese children and adolescents tend to have lower self-efficacy and self-esteem. Obese adolescent females were nearly twice as likely as average weight females to report not hanging out with friends, feeling hopeless, having serious emotional problems, and attempting to commit suicide (Falkner et al., 2001). Obese males were nearly two times more likely than their average-weight counterparts to report not similar outcomes. In general, obese girls were also more likely to perceive themselves as below average students and not expect to finish college (Falkner et al., 2001). Analysis by the National Obesity Observatory found a strong association between deprivation and the density of fast food outlets. (Melissa , Karalti ,2015)

Table (1) from journal of American dietetic Association volume 105 issue 5 2005

BMI (kg/m²)	WHO classification	Popular description
<18.5	Underweight	Thin
18.5-24.9	Normal range	“Healthy”,normalor“acceptable”weight
25.0-29.9	Grade 1 overweight	Overweight
30.0-39.9	Grade 2 overweight	Obesity
≥40.0	Grade 3 overweight	Morbid obesity

2.9 Weight Gain:-

According to the Massachusetts Medical Society Committee on Nutrition, fast food is especially high in fat content, and studies have found associations between fast food intake and increased body mass index (BMI) and weight gain. The Centre for Disease Control and Prevention (CDC) has defined overweight as “a BMI at or above the 85th percentile and lower than the 95th percentile for children of the same age and sex” (CDC, 2013). However, it appears that children who do not eat breakfast every day at age 5 are more likely to be overweight. This may be because children who do not eat breakfast may tend to snack on foods that are high in fat and sugar instead. Also Sedentary behaviour like Children who watched TV/used a computer for at least two hours per day were more likely to be overweight . (Independent of diet and other factors). Finally, children who generally travelled to and from school by car, bus or other vehicle were also more likely to be overweight at age 5 than those who walked or cycled. (Kirstine Hansen, et al., 2010).

2.10 Diabetes:-

Dense sugar content can cause dental cavities and type 2 diabetes mellitus. A short-term adverse effect as a result of eating junk foods, lack of energy which occurs because junk foods don't provide essential nutrients, even though they can be very much sufficing, due to which one feels weakened. Unfortunately, Meals consisting of junk food don't fill up for long. Because they are lacking in fibre, and are made of processed foods, they are rated high on the glycaemic index, which means they provide a quick rise in blood sugar, but this also falls quickly, and giving rise to hunger. The high levels of sugar in junk food which puts metabolism under stress; when refined sugar is taken, the pancreas secretes high amounts of insulin to prevent a dangerous spike in blood sugar levels. Because fast food and junk food don't contain adequate amounts of protein and good carbohydrates, the blood sugar levels suddenly drops after eating, resulting with fatigued feeling and a craving for sugar. Another pathway which acetyl CoA is involved is in formation of ketone bodies, which is inactive when energy levels are high, but is active in case when weak glucose sets in. Carbonated soft drinks, in addition to towering amount of sugar reportedly contain methylglyoxal (MG), which is strongly associated with human carbonyl stress. Fried and processed food, contains high amounts of Trans fats, saturated fats in addition to ox cholesterol. Ox cholesterol is a little-known type of cholesterol which may prove to be a lethal compound to heart health as reported by Scientists from China in the National Meeting of the American Chemical Society in August 2009. (Geeta Arya, Sunita Mishra ,2013)

2.11 Heart Disease:-

Fast foods have high level of fat and sugars that are not only unhealthy but addictive and that creates a vicious cycle making it hard for children to choose healthy food. High content of Tran's fat in commercially available fast foods exposed children to risk of future heart diseases. Energy Density of fast

food is more than twice the recommended daily allowance for child taken. Fast food intake leads to higher proportion of calories being derived from total and saturated fat .Moreover, the micronutrient content (carotene, vitamin A, vitamin C) of the fast food is also low levels of calcium and magnesium in the taken. (Geeta Arya, Sunita Mishra , 2013)

2.12 High Blood Pressure:-

High sodium level has been clearly implicated as the causative factor for high blood pressure. Sodium is known to affect renin-angiotensin system in kidneys, which produces vasoconstrictive effects on arterioles, leading to development of high blood pressure. Also the salts used for the preparation has an impact of their excretion through kidneys, thus having an effect on renal system. High cholesterol from junk food also affects liver on the long run where it is metabolized as its trains liver, damaging it eventually.. Cholesterol and salt are known to set off blood pressure, stroke and heart diseases in a chain. Excessive salts can affect functioning of kidneys too. Excess fats and oils along with spices added in these foods act as an irritant to gastric mucosa leading to excess secretion of hydrochloric acid, landing in gastritis. Poor concentration is another result of junk food habit known to affect in immediate and medium term periods. When a sumptuous junk meal rich in oil is taken, there is a feeling of drowsiness and failure to concentrate. The junk food eating over a sustainable period of time can drop blood circulation due to fat accumulation. Lack of vital oxygen, nutrients and proteins particularly can stale the grey (brain) cells temporarily. (Geeta Arya, Sunita Mishra ,2013)

2.13 Cancer:-

Definition of cancer is an deviant growth of cells caused by multiple changes in gene expression leading to deregulated balance of cell proliferation and cell death and ultimately evolving into a population of cells that can invade tissues and metastasize to distant sites, causing significant morbidity and, if

untreated, death of the host The prevalence of overweight and obesity has ascended from 15% in 1980 to 35% in 2005 and it will continue to increase in the future. Almost 22% of the whole cancer cases resulted from obesity and overweight according to the research done by (Wolin et al ,2010). From multiple adequate evidences, it has been recorded about that obesity importantly causes a lot of types of cancer such as adenocarcinoma of oesophagus, colorectal cancer, endometrial cancer (the lining of the uterus), post-menopausal breast cancer and renal cell cancer. Furthermore, obesity can lead to elevate other cancer risk the kind of gallbladder cancer, pancreatic cancer, hepatocellular cancer (subtype of liver cancer), thyroid cancer, cervical cancer (adenocarcinoma of the cervix), Non-Hodgkin lymphoma (NHL), leukaemia, multiple myeloma and malignant melanoma (a type of skin cancer). The attributable risks are 46% for endometrial cancer, 41% for gallbladder cancer between females, 40% for adenocarcinoma of oesophagus between males, 37% for adenocarcinoma of oesophagus between females, 27% for kidney cancer between females, 22% for kidney cancer between males, 22% for colon cancer between males, and 16% for breast cancer respectively in the 2008 meta-analysis. In addition, current investigations asserted that the attributable risks for all cancers are approximately 5% between males and 6% between females by associating with obesity and overweight in the UK. However, the mechanisms between cancer risk and obesity are uncertain and can be different according to the cancer types and also associated with the fat distribution in organism. Therefore, between some cancer types, waist hip ratio and waist circumference have been found to be more relevant than BMI because abdominal obesity can be diagnosed better with waist hip ratio and waist circumference. Generally, increased plasma insulin levels, increase IGF-1(IGF: Insulin Like Growth Factor) reduced IGFBP-1 (IGFBP: Insulin Like Growth Factor Binding Proteins), and low plasma levels can be shown for mechanism of many of cancer types. In

addition, adipokinesis can also be added in these mechanisms. Though data are still emerging and obesity is not linked to an increased risk of developing all types of cancer, research suggests that the risk of developing and dying from many common cancers is increased in obese individuals. Research on the relationship between obesity and cancer has increased dramatically in the last several years. Obesity is also linked to poorer cancer outcomes, including higher risk of recurrence and cancer-specific and overall mortality. There is some suggestion that weight gain after cancer diagnosis leads to poor outcomes, although data are less consistent. The data linking obesity to poor outcomes is strongest in breast, prostate and colorectal cancers (see table), but emerging data suggest that obesity may be a prognostic factor in other malignancies as well, including childhood leukaemia.(Melissa , İskender,2015)

Table (2) from journal of Adolescent health volume 6 2006

Cancer Type	Evidence
Breast	*Obesity at diagnosis is linked to a 33% increase in the risk of breast cancer related and overall mortality in pre- and postmenopausal women with early-stage breast cancer. *Poor prognosis in obese breast cancer patients continues to be seen in individuals treated with anthracyclines and taxane-based treatment regimens and aromatase inhibitors, suggesting that the poor outcomes seen in

	obese individuals are independent of treatment factors
Colorectal	*Data regarding the relationship between weight and colon cancer outcomes have been mixed. *A recent meta-analysis of seven adjuvant chemotherapy trials for patients with stage II and III colorectal cancer treated with fluorouracil-based therapy found men with class II and III obesity (BMI ≥ 35kg/m2) and women with Class I obesity (BMI ≥ 30kg/m2) had significantly worse overall survival as compared to normal weight individuals
Prostate	*Obesity is associated with the development of biologically more aggressive and advanced prostate cancer. *The extent of body fatness and weight gain before/around the time of prostate cancer diagnosis is associated with an increased risk of recurrence and death. *Obesity is associated with reduced response to prostate cancer treatment

Childhood leukemia	*Obesity may be linked to poor outcomes in children with acute leukemia.28,29 *Being overweight/obese before hematopoietic cell transplantation is associated with lower survival and higher rates of acute graft-versus-host disease and treatment-related mortality

2.14cognitive performance:-

Nutrition is usually considered to be important for physical health but mental health must be taken as equally important. Research in the field has shown that nutrition is one of many factors that potentially influence a child's development besides genetic, socio-economic, environmental and behavioural factors (Associate Parliamentary & Health, 2008; Bryan et al., 2004). Understanding the relationship between nutrition and mental performance in children is important regarding their attainment and productivity both in school and in later life (Alderman, et al., 1997) and (Florence, et al. ,2008).To date, there is a growing body of evidence that diet might influence the development and functioning of the brain which in turn has an effect on mental performance as a functional outcome, especially when the brain is still developing during childhood and early adolescence (Benton, 2008a). A diet containing too many ingredients that are detrimental in excess or lacking essential nutrients is likely to have adverse consequences for mental outcomes (Associate Parliamentary & Health, 2008) whereas a balanced diet is important for physical wellbeing and mental health, with implications for school performance (Associate Parliamentary & Health, 2008; Florence et al.,

2008). Thus, children should have a varied diet with good nutritional content and regular intake to ensure the best possible cognitive development and performance (Bellisle, 2004). Since parents are seen as gate keepers to a child's diet and provide the key environment for the development of a child's eating behaviours (Birch & Davison, 2001; Brown, et al, 2008), they constitute an important group of consumers for nutritional communication through policies, public health intervention programmes as well as through health claims on functional food products. Parents influence all aspects of a child's life to some degree including the development of food choices as well as controlling the availability and types of food in the home (R. Brown & Ogden, 2004; Golan & Crow, 2004). Moreover, parents' own eating behaviours influence those of their children (Birch & Davison, 2001) and thus the family provides a key environment for young children to learn and develop eating habits and food preferences. As children grow and attend school other people such as peers and teachers become more important influences and children gradually become more independent of their parents(Perez-Rodrigo & Aranceta, 2001). The family is seen as one of the major contexts of a child's development which includes cognitive development and achievement (Scott-Jones, 1984). Previous research has highlighted the importance of the home environment on the development of a child's eating behaviours (Birch & Fisher, 1998) and also explored parental views about child feeding (Coveney, 2005; Sherry et al., 2004). Parents' belief systems and attitudes as well as their expectations and aspirations are assumed to be cognitive mediators of their interactions with their children which in turn influence a child's cognitive development e.g. by feeding practices and provision of intellectual stimulation at home (Scott-Jones, 1984). In this context, consumer research to understand parental perceptions, attitudes and beliefs becomes of crucial importance. To date there seems to be, to the best of knowledge, an absence of published research about attitudes,

beliefs and perceptions of parents concerning the relationship between a child's diet and their mental state and performance. The present work aims to qualitatively and quantitatively examine the current perceptions and beliefs of parents of the relationship between what children eat and their mental development, state and performance. The research was divided into three studies, carried out in four European countries and funded within the framework of the nutriment the project which aims to further our understanding and knowledge of the effect of nutrition on the mental development and performance in children.

1- The effects of diet on the mental performance in children :-

Review of contemporary literature Diet consists of two major food component groups: macro- and micronutrients which are classified according to their proportional amount in foods. Macronutrients are fat, proteins and carbohydrates whereas vitamins and minerals make up the class of micronutrients Both groups of nutrients can affect brain and cognitive development which is reflected by outcomes such as mental performance, mood and behaviour as well as mental disorders (Associate Parliamentary & Health, 2008; Joachim Westenhoefer et al., 2004). It is obvious that nutrients are normally not consumed isolated but in the context of a diet. Thus, one cannot disregard the fact that it is the composition of a child's diet and the eating behaviours which play a vital role. This has been shown in several studies examining either the composition of diet or the effect of regularity of meals on a child's mental performance (Benton & Jarvis, 2007; Mahoney, Taylor, Kanarek, & Samuel, 2005; Pollitt, 1995; Taras, 2005a).The challenge for research in the field is to identify, specify and characterise the interaction between single nutrients, diet and cognitive development as well as mental performance in children. The research results will have to be transformed into recommendations, intervention programmes and nutritional information

aimed at parents and children in order to find expression in a child's every day diet.

2- The effects of nutrients on the structure and function of the developing brain:-

As the brain develops and grows throughout childhood, one might expect greater demands on the provision of nutrition during periods of rapid growth which if deficient could impair brain structure development. This could have long-term consequences for mental functioning. For instance, brain development during childhood includes that of the frontal lobes - nutrition could affect frontal lobe development, influencing the higher cognitive functions they control (such as focusing attention and inhibiting irrelevant stimulation)(Bryan et al., 2004). On a more detailed level, certain nutrients can affect brain cell integrity and structures, signal transduction and neurotransmission as well as brain energy supply and metabolism (Schmitt, Benton, & Kallus, 2005).

Minerals - Iron, Iodine and Zinc as the major players Iron may play a critical role in cognitive development and later performance (Thomas, Grant, &Aubuchon-Endsley, 2009). The brain tissue is overall rich in Iron and the most sensitive brain areas are the striatum, hippocampus and cortex. A deficit in iron may mainly act globally on two different levels: on the one hand by less efficient supply of oxygen to the brain, on the other hand by decreasing the activity of the enzyme cytochrome C oxidase in cerebral regions which leads to less energy production in the brain (Lozoff&Georgieff, 2006). A decreased metabolic activity of brain cells is the consequence. Thus, all nervous cell types are affected and as a result iron deficiency during early development perturbs cognitive functions in the long term (Bourre, 2006a). Other possible pathways could include functional changes of the brain, lags in the myelin formation or alterations in the dopamine system, particularly the dopamine receptors, or delay of the acquisition of motor skills due to

constraints of oxygen supply in anaemic infants (Bryan et al., 2004).There is considerable evidence that iron deficiency anaemia in children in developing countries is associated with impaired cognitive development (Joachim Westenhoefer et al 2004).Iodine is required for the production of two thyroid hormones (triiodothyronine and thyroxine) both of which are essential for the development and growth of the brain (Bryan et al., 2004). A deficiency of either iodine or thyroid hormones (hypothyroidism) during critical periods of cerebral development induces not only a slowing of the metabolic activity of brain cells but also permanent alterations in the development of the brain. The most obvious sign of this impairment is irreversible mental retardation (Bourre, 2006a). Iodine deficiency is considered the first cerebral disease in the world although being easy to prevent by iodine supplementation, especially during pregnancy when brain development of the fetus is most rapid (Bourre, 2006a). Iodine deficiency is anticipated to lower the development and growth of brain on average by 10 to 15 points at a general population level (Delange, 2001), with adverse implications for the socioeconomics of a community. Zinc plays a role in a multitude of molecular and physiological mechanisms such as gene expression and protein synthesis. Even mild to moderate forms of zinc deficiency in children have been shown associated with reduced development and growth as well as impaired immune function (Bhutta et al., 1999; Brown, et al, 2002). An insufficient supply of zinc may affect cognitive development by alterations of activity, attention, motor development and neuropsychological behaviour. While the exact mechanisms are not clearly identified yet, it is anticipated that zinc is vital for neurogenesis, neuromigration and synaptogenesis which are all fundamental processes in brain function. In many parts of the world, zinc deficiency is likely to be a major public health problem (Brown KH, 2001).Role of the B-vitamins The B-vitamin group comprises vitamin B1 (thiamine), vitamin B2 (riboflavin), vitamin B3 (niacin), vitamin B6 (pyridoxine), vitamin B9, which

is known as folate or folic acid, and vitamin B12 (cobalamin). While special emphasis is attributed to folate and its function in neural tube formation during embryogenesis, all B-vitamins have been shown to be essential for normal functioning of the brain (Bourre, 2006a). Vitamin B1 for instance facilitates the use of glucose, thus ensuring energy production in the brain. A deficiency in this vitamin results in a severe disease with observed signs of lower intelligence and lassitude, but which are reversible (Bourre, 2006a). The B vitamins folate, cobalamin and pyridoxine share a metabolic pathway that might have acute and long term effects on the Central Nervous System (CNS) (Bryan et al., 2004). It has been indicated that those vitamins have an influence on cognitive performance through their role in methylation in the CNS which in turn affects the metabolism of neurotransmitters (e.g.dopamine, serotonin), all of which are crucial to psychological and neurological status (Bryan et al., 2004).Essential fatty acids Due to its cellular composition, the brain contains a large amount (60%) of lipids (Bryan et al., 2004). Since the human body cannot efficiently synthesise essential fatty acids (EFAs),they must be acquired from food. Consequently, quantity and form of fats consumed may affect brain structure and functioning (Associate Parliamentary & Health, 2008). Polyunsaturated fatty acids (PUFAs) omega-3 and omega-6, particularly Docosahexaenoic acid (DHA) and Eicosapentaenoic acid (EPA), are deemed to be of particular importance for brain development and function. For instance, a deficit in DHA can lead to a reduction of brain signalling by 90% (Associate Parliamentary & Health, 2008). The main mechanism behind the influences of omega-3-PUFAs on cognitive development and functioning seems to be through the maintenance of cell membrane integrity and cell compartment functioning in the CNS (Bourre, 2006a). During f et al development and the postnatal phase, a huge amount of PUFA and long-chain PUFA (LCPUFA) is deposited in the brain. Human breast milk contains n-3 and n-6 LCPUFA, and addition to infant

formulae has been suggested some years ago (Koletzko et al., 2001). While many clinical trials found an improvement of biochemical measures of LCPUFA status through supplementation (Fleith& Clandinin, 2005), there is still no consensus about long term neurological benefits from optimising the fatty acid status of infants during the pre-or postnatal phase (Szajewska, Horvath, & Koletzko, 2006).However, at a later age, omega-3 provision has been associated with improvements in spelling, reading and learning in children with specific motor function impairments (Gomez- Pinilla, 2008). This is consistent with findings that show that brain areas responsible for this kind of higher order cognitive functions, such as the striatum and frontal cortex, are very rich in DHA (Bryan et al., 2004). Much research is ongoing in this area to determine the effects of those EFAs on mental development and performance in children. Proteins Particularly during development, the brain needs a sufficient supply of amino acids for the synthesis of certain neurotransmitters (e.g.catecholamines, serotonin), The quality of dietary proteins influences the nature and the quantities of cerebral proteins and neurotransmitters and since the human body does not possess a reserve for proteins, essential amino acids have to be acquired from food every day (Bourre, 2006b). One of those essential amino acids is tryptophan which is required as a precursor for the synthesis of the neurotransmitter serotonin. In addition to modulating appetite and satiety, serotonin also affects sleep and mood. Dietary tryptophan has been shown to have an effect on mood and also on depression (Bourre, 2006b).On a more general level, protein-energy-malnutrition (PEM) has been identified associated with stunting and impaired IQ and school performance in children by cross-sectional studies (Mendez & Adair, 1999). Results show that PEM in early life has lasting effects up to 15 years of age on school performance and scores of intelligent quota (IQ) which highlights the importance of adequate energy and protein supply in early life (Bryan et al., 2004).

3- The role of diet on mental state and performance in school aged children:-

Beyond specific nutrients and their role in cognitive development und function, eating behaviours such as skipping breakfast is considered to potentially contribute to poor academic performance. Breakfast is seen as an important first source of energy for the day, so that the brain can cope with the demands of the morning (Bellisle, 2004). Children and adolescents seem to be most likely to skip breakfast (Rampersaud, et al, 2005) – this has lead to an increased awareness in public health and the initiation of school breakfast programmes. While skipping breakfast induces short term metabolic changes, it may also affect overall nutritional status (Pollitt, 1995). The effect of breakfast on cognitive performance may be by providing essential nutrients to the brain as well as alleviating hunger. A lack of energy leads to decreased glucose and insulin levels in the body associated with impaired cognitive functioning. If such a lack of energy provision to the brain occurs frequently, it may be reflected in the level of school performance in the long run (Pollitt, 1995). Although breakfast has been observed to have an effect on many areas of brain functioning such as attention and memory, a review of studies examining the relation of diet and school performance in children by Ells et al in 2008 revealed inconclusive results (Ells et al., 2008). Since children who eat breakfast have been observed to have higher intakes of protein, carbohydrates and other nutrients, they are more likely to meet the daily recommendations (Rampersaud et al., 2005). Thus, children who are nutritionally at risk are suggested to benefit most from having breakfast (Pollitt, 1995; Rampersaud et al., 2005).

A combined breakfast of milk and cereal has been shown to significantly reduce attention decline during the morning when compared to children who had no breakfast or a drink of glucose only (Wesnes, et al, 2003). Moreover, findings by Benton et al (2007) demonstrated that compared to those children

consuming a higher calorie meal, a small, low calorie breakfast significantly lowered levels of attention (Benton & Jarvis, 2007). Supported also by findings from other studies, it is suggested that size and type of the breakfast consumed have an effect on attention and on centration levels through the release rate of glucose to the brain (Benton & Parker, 1998). Thus, maintaining performance would be best supported by a low glycaemic index breakfast containing carbohydrates, protein and fibre (Benton, et al, 2007). It has been shown that beyond breakfast which plays an important role in cognitive performance, a steady supply of energy by snacking is also important. A study by Benton et al observed that 9 year old children who had a breakfast of low caloric content were less attentive in class than those who ate a larger breakfast, but this effect could be compensated by a midmorning snack (Benton & Jarvis, 2007). Another study on breakfast and snacking found that a midmorning snack improved memory function in low socioeconomic children even when overall calorie intake was kept constant (Muthayya et al., 2007) - the positive effect of snacking in low socioeconomic children might be due to their poorer nutritional status. The reported effects of snacking and breakfast indicate that eating habits as well as meal patterns potentially influence children's mental state and performance. Nevertheless these observations, there has been little focus on the importance of other meals than breakfast and their composition. Since families, and especially parents, influence all aspects of a child's life including eating habits and controlling the types and availability of food at home, it is of crucial importance to evaluate parental belief systems and perceptions in order to guide and substantiate nutritional information and intervention aiming at improving a child's mental state and performance through adequate nutrition. (med and Christoph)

Obesity is known to affect vital organs, such as the heart and lungs; and recent research has shown that obese adolescents have lower cognitive

performance, indicating that the cognitive abilities may also be affected (Yau, et al, 2012). Researchers have investigated the link between children's health and nutrition and their academic achievement. They have examined a number of factors related to this relationship, including children's weight, amount and quality of food consumption, and amount of physical activity. Others have also studied aspects of family life, such as income level and parent level of education, in addition to how families as well as schools can promote healthful living and nutrition in children and—as a potential consequence—children's academic achievement. The current project involved a literature review in which the link between school-aged children's weight and nutrition and their achievement in school was examined .A study of 7,000third graders, who had originally been tracked in kindergarten, showed that those children who were obese were more likely to repeat a grade than their classmates who maintain acceptable weight (Datar& Sturm, 2006). (Tobin 2013) found that that the frequent consumption of fast food (multiple times per week)was significantly related to a decrease in test scores in math and reading, and as the student consumed more fast food, the test scores continued to decrease. Students who had a higher than average intake of fast food had between 5% and 16% percent lower reading test scores and between 6% and 18% lower math test scores (Tobin, 2013). Students who have lower levels of physical activity are more likely to be obese; students who have lower levels of physical activity are also more likely to have lower GPAs. In addition to food consumption and nutrition, physical activity is a major factor in an individual's weight; as levels of physical activity decrease, the risk of becoming obese increases. Research indicates that children with low motor skills also seem to have higher rates of childhood obesity. As students grow older, their level of physical activity has a positive correlation with GPA. This means that as their amount of physical activity increases, their GPA increases; conversely, as their level of physical activity decreases, their GPA also

decreases. (Kantomaa et al., 2013). Students who have lower levels of physical activity are more likely to be obese; students who have lower levels of physical activity are also more likely to have lower GPAs. (Kayla ,2013)

2.15 Social and psychological problems:-

Besides physical consequences, obesity can also lead to social and psychological problems. As early as five years of age, overweight or obese children display lower self-esteem (Davison & Birch, 2001). Obese adolescent females demonstrated significantly lower levels of self-esteem, which led to sadness, loneliness, and high-risk behaviours, such as smoking or alcohol consumption (Strauss, 2000). Research has shown links between weight status and social and emotional skills and beliefs. For instance, girls who were overweight or obese not only were significantly more likely to score lower on math and reading tests, but they also had struggles related to social and emotional behaviours (Datar& Sturm, 2006). These overweight females struggled to interpret and thus communicate their feelings appropriately as well as connect with their peers. Obese adolescents also face social consequences in addition to academic ones. Although an important area to examine in its own right, social and emotional skills and behaviours contribute to the way children learn in the classroom. According to a study of seventh to 12th graders, obese adolescents struggled both academically and socially, receiving lower GPAs. Adolescents at risk of obesity struggled to connect with peers, in particularly those of the opposite sex (Crosnoe& Muller, 2004).In addition to social problems, obese children and adolescents tend to have lower self-efficacy and self-esteem. Obese adolescent females were nearly twice as likely as average weight females to report not hanging out with friends, feeling hopeless, having serious emotional problems, and attempting to commit suicide (Falkner et al., 2001). Obese males were nearly two times more likely than their average-weight counterparts to report not similar outcomes. In general, obese girls were also more likely to perceive

themselves as below average students and not expect to finish college (Falkner et al., 2001). In conjunction with lower self-esteem, researchers in Finland found that more than half of teenagers were dissatisfied with their weight. Of the female participants who were dissatisfied, they were more likely to think of themselves as overweight and to engage in the UN healthful behaviours (Mikkila, et al, 2003). Connecting across these studies, I found an indication that (a) students who are overweight tend to have lower self-esteem and social skills and (b) students with lower rates of self-esteem and social skills are more likely to perform poorly in the classroom. (Kayla , 2013).

Chapter three

History and Name

Pearson's Chi squared – Test

What is a Chi-Square Statistic

Chi Square P-Values

Other examples of chi-squared tests

Yates's correction for continuity

Types of Data

Using Chi-Square Statistic in Research

Uses of chi square test

Table of $\chi 2$ values vs p-values

3.1History and Name:-

This distribution was first described by the German statistician Friedrich Robert Helmert where he computed the sampling distribution of the sample variance of a normal population(Hald,1998). Thus in German this was traditionally known as the Helmert'sche or ("Helmertian") or "Helmert distribution (F. R. Helmert,1876). The distribution was independently rediscovered by the English mathematician Karl Pearson in the context of goodness of fit, for which he developed his Pearson's chisquaredtest, published in 1900, with computed table of values published (Elderton,1902). The name "chi-squared" ultimately derives from Pearson's shorthand for the exponent in a multi variate normal distribution with the Greek letter Chi, writing $\chi 2$ (R. L. Plackett, Karl Pearson,1983).The idea of a family of "chi-squared distributions", however, is not due to Pearson but arose as a further development due to Fisher in 1920.(M.A. Sanders)

Pearson's Chi squared – Test:-

In 1900 Pearson published the remarkable paper on $\chi 2$ test which is considered to be one of the foundation of modern statistics in this paper Pearson investigate the test of goodness of fit.

Suppose that n observation in a random sample from a population are classified into mutually exclusive classes with respective observe number χ_i (i=1.2……..k) and the null hypothesis gives the probability p_i that an observation falls into the i^{th} class. So we have expected number m_i =np for all where

$$\sum_{i=1}^{k} p_i = \quad 1 \; and \;\; \sum_{i=1}^{k} m_i = \sum_{i=1}^{k} x_i \; = n \ldots\ldots\ldots\ldots\ldots\ldots \quad (1)$$

Pearson proposed that , under the circumference of the null hypothesis being correct , as n $\rightarrow \infty$ the limiting distribution of the quantity given below is the $\chi 2$ distribution.

$$X^2 = \sum_{i=1}^{k} \frac{(x_i - m_i)^2}{m_i} = \sum_{i=1}^{k} \frac{x_i^2}{m_i} - n \qquad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (2)$$

Pearson dealt first with the case in which the expected number m_i were large enough known numbers in all cells assuming every χ_i may be taken as normally distributed , and reached the result that in the limit as n becomes large $\chi 2$ followed the $\chi 2$ distribution with (K-1) degree of freedom.

However, Person next considered the case in which the expected numbers depends on the parameters that had be estimated from the sample, and suggested that , with the notation of m_i being the true expected numbers and $\bar{m}_i$ being the estimated expected numbers , the difference .

$$X^2 - X'^2 = \sum_{i=1}^{k} \frac{x_i^2}{m_i} - \sum_{i=1}^{k} \frac{x_i^2}{m_i'} \qquad \ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Will usually be positive and small enough to be omitted. In conclusion, Person argued that if we regarded X^{-2} and X^2 distribution with (K-1) degree of freedom that the error in this approximation would not affect practical decisions. This conclusion caused some controversy in practical applications and was not settled for 20 years until Fisher in 1922 and 1924 paper.

3.2What is a Chi Square Test:-

There are two types of chi-square tests. Both use the chi-square statistic and distribution for different purposes:

1-Achi-square goodness of fit test determines if a sample data matches a population.

2- A chi-square test for independence compares two variables in a contingency table to see if they are related. In a more general sense, it tests to see whether distributions of categorical variables differ from each another.

A very small chi square test statistic means that your observed data fits your expected data extremely well. In other words, there is a relationship.

A very large chi square test statistic means that the data does not fit very well. In other words, there isn’t a relationship.

3.3What is a Chi-Square Statistic:-

The formula for the chi-square statistic used in the chi square test is:

$$\chi_c^2 = \sum \frac{(O_i - E_i)^2}{E_i} \qquad \text{----------(4)}$$

The subscript "c" is the degrees of freedom. "O" is your observed value and E is your expected value. It's very rare that you'll want to actually *use* this formula to find a critical chi-square value by hand. The summation symbol means that you'll have to perform a calculation for every single data item in your data set. As you can probably imagine, the calculations can get very, very, lengthy and tedious. Instead, you'll probably want to use technology like Chi Square Test in SPSS or Chi Square P-Value in Excel. A chi-square statistic is one way to show a relationship between two categorical variables. In statistics, there are two types of variables: numerical (countable) variables and non-numerical (categorical) variables. The chi-squared statistic is a single number that tells you how much difference exists between your observed counts and the counts you would expect if there were no relationship at all in the population. There are a few variations on the chi-square statistic. Which one you use depends upon how you collected the data and which hypothesis is being tested. However, all of the variations use the same idea, which is that you are comparing your expected values with the values you actually collect. One of the most common forms can be used for contingency tables:

$$c^2 = \sum_{i=1}^{k} \left[\frac{(O_i - E_i)^2}{E_i} \right] \qquad \text{----------(5)}$$

Where O is the observed value, E is the expected value and "i" is the "i^{th}" position in the contingency table. A low value for chi-square means there is a high correlation between your two sets of data. In theory, if your observed

and expected values were equal ("no difference") then chi-square would be zero — an event that is unlikely to happen in real life. Deciding whether a chi-square test statistic is large enough to indicate a statistically significant difference isn't as easy it seems. It would be nice if we could say a chi-square test statistic >10 means a difference, but unfortunately that isn't the case. You could take your calculated chi-square value and compare it to a critical value from a chi-square table. If the chi-square value is more than the critical value, then there is a significant difference. You could also use a p-value. First state the null hypothesis and the alternate hypothesis. Then generate a chi-square curve for your results along with a p-value. Small p-values (under 5%) usually indicate that a difference is significant (or "small enough").

The Chi-square statistic can only be used on numbers. They can't be used for percentages, proportions, means or similar statistical value.

3.4Chi Square P-Values:-

A chi square test will give you a p-value. The p-value will tell you if your test results are significant or not. In order to perform a chi square test and get the p-value, you need two pieces of information.

1-Degrees of freedom. That's just the number of categories minus 1.

2-The alpha level (α). This is chosen by you, or the researcher. The usual alpha level is 0.05 (5%), but you could also have other levels like 0.01 or 0.10.

In elementary statistics or applied statistics, both the degrees of freedom (df) and the alpha level are usually given to you in a question. You don't normally have to figure out what they are. You *may* have to figure out the df yourself, but it's pretty simple: count the categories and subtract 1. Degrees of freedom are placed as a subscript after the chi-square (X^2) symbol. For example, the following chi square shows 6 df:X^2_6. And this chi square shows 4 df:X^2_4.

3.5 Other examples of chi-squared tests:-

One test statistic that follows a chi-squared distribution exactly is the test that the variance of a normally distributed population has a given value based on a sample variance. Such tests are uncommon in practice because the true variance of the population is usually unknown. However, there are several statistical tests where the chi squared distribution is approximately valid:

1-Fisher's exact test

For an exact test used in place of the 2 x 2 chi-squared test for independence.

2-Binomial test

For an exact test used in place of the 2 x 1 chi-squared test for goodness of fit.

3-Cochran–Mantel–Haenszel chi-squared test.

4-McNemar's test, used in certain 2 × 2 tables with pairing

5-Tukey's test of additivity.

6-The portmanteau test in time-series analysis, testing for the presence of autocorrelation

7-Likelihood-ratio tests in general statistical modelling, for testing whether there is evidence of the need to move from a simple model to a more complicated one (where the simple model is nested within the complicated one).

3.6Yates's correction for continuity:-

Using the chi-squared distribution to interpret Pearson's chi-squared statistic requires one to assume that the discrete probability of observed binomial frequencies in the table can be approximated by the continuous chi-squared distribution. This assumption is not quite correct and introduces some error.

To reduce the error in approximation, Frank Yates suggested a correction for continuity that adjusts the formula for Pearson's chi-squared test by subtracting 0.5 from the absolute difference between each observed value and its expected value in a 2 × 2 contingency table. This reduces the chi-squared value obtained and thus increases its p-value. (Yates, Frank ,1934)

3.7Types of Data:-

There are basically two types of random variables and they yield two types of data: numerical and categorical. A chi square (X^2) statistic is used to investigate whether distributions of categorical variables differ from one another. Basically categorical variable yield data in the categories and numerical variables yield data in numerical form. Responses to such questions as "What is your major?" or Do you own a car?" are categorical because they yield data such as "biology" or "no." In contrast, responses to such questions as "How tall are you?" or "What is your G.P.A.?" are numerical. Numerical data can be either discrete or continuous.

Notice that discrete data arise from a counting process, while continuous data arise from a measuring process. The Chi Square statistic compares the tallies or counts of categorical responses between two (or more) independent groups. (note: Chi square tests can only be used on actual numbers and not on percentages, proportions, means, etc.)

3.8Using Chi-Square Statistic in Research:-

The Chi Square statistic is commonly used for testing relationships between categorical variables. The null hypothesis of the Chi-Square test is that no relationship exists on the categorical variables in the population; they are independent.

3.9Usesof chi square test:-

The chi-squared distribution has many uses in statistics, including:

1-Confidence interval estimation for a population standard deviation of a normal distribution from a sample standard deviation.

2-Independence of two criteria of classification of qualitative variables.

3-Relationships between categorical variables (contingency tables).

4-Sample variance study when the underlying distribution is normal.

5-Tests of deviations of differences between expected and observed frequencies (one-way tables).

6-The chi-square test (a goodness of fit test). (Johns Hopkins University , 2015)

3.10Table of $\chi 2$ values vs p-values:-

The p-value is the probability of observing a test statistic at least as extreme in a chi-square distribution. Accordingly, since the cumulative distribution function (CDF) for the appropriate degrees of freedom (df) gives the probability of having obtained a value less extreme than this point, subtracting the CDF value from 1 gives the p-value. A low p-value, below the chosen significance level, indicates statistical significance, i.e., sufficient evidence to reject the null hypothesis. A significance level of 0.05 is often used as the cut off between significant and not-significant results.

Chapter four

Analysis and discussion

Demography characteristics

Number of breakfast eaten per week

Number of lunch eaten per week

Number of dinner eaten per week

Number of fool (bush) eaten per week

Number of tameia eaten per week

Number of eggs eaten per week

Number of burger, hotdog, pizza, fish and chicken eaten per week

Number of Andome eaten per week

Number of potato chips eaten per week

Number of milk drunk and cheese eaten per week

Number of fruits eaten per week

Number of vegetables or salad eaten per week

Number of chips eaten per week

Number of sweets eaten per day

Number of carbonated beverages drunk per day

Number of carbonated fruit juice drunk per day

The effect of parent's education in selected of kind of food

The impact of activities due to meal taken

The effect of nutrition knowledge in junk food

Hypotheses testing

4.1Analysis and discussion

A-Preface

This research looking for another method to modelized and discussed the major problems faced most students in Sudan represented in junk food in school specially in Omdurman region, which included various schools governmental, private and foreign schools to viewed your student opinions and their parents, also grade eight main respondents additive to first, second and third class in secondary school, data with the presence of large sample. This section has discussed the research design, area of study, population, sample of the population, sampling technique, and instrument for data collection, administration of the instrument and method of data analysis. The methodology used to estimate the drinking, eating held by students, the samples for junk food rate with a good prognostic indicator for 384 students in various grade at Omdurman province, Sudan during winter semester, October 2018 to December 2019. Students with the following data were studied. The students had been grade in class eight, and three major classes in secondary school (first, second, and third). The student's parents have records in the archives of their schools and in their files in same schools. The quantity consumption of junk food and it side effect, obesity and academic result, social and economic effect, degree getting of students was determined after take multi-type of junk food and were still in study at the end of class. Statistical packages used for analysis was “SPSS” that calculated and find the relationship of main reasons that caused by junk food. Chi-square distributions used to make this relation reality, cross-tabulation also needed to know how often junk size affect which get from the population sample after study, however, the statistical tools were appeared significant in dealing with data and provided more appropriate results that well described junk food situation.

B-Description of Enhanced Selective Acknowledgements:-

The technique that used in this study was frequencies, diagram, and chi-square test (both parametric like cross-tab and nonparametric) methods. The population sample collated comprehensively as secondary data from the statistical unit at Omdurman province schools (basic and secondary). This data was collected using questionnaire, in period from October 2018 up to December 2019. In governmental schools, private schools, and foreign schools located in Omdurman.

4.2 Demography characteristics:-

1-The medium, age and standard deviation of the students:-

Table (1)

Statistic	Age/ years	Weight/ K g	Height/ Cm
Mean/median	15 (median)	49.7	149.6
Std. deviation	1.269	11.355	18.512
Minimum	10	15	70
Maximum	19	97	193

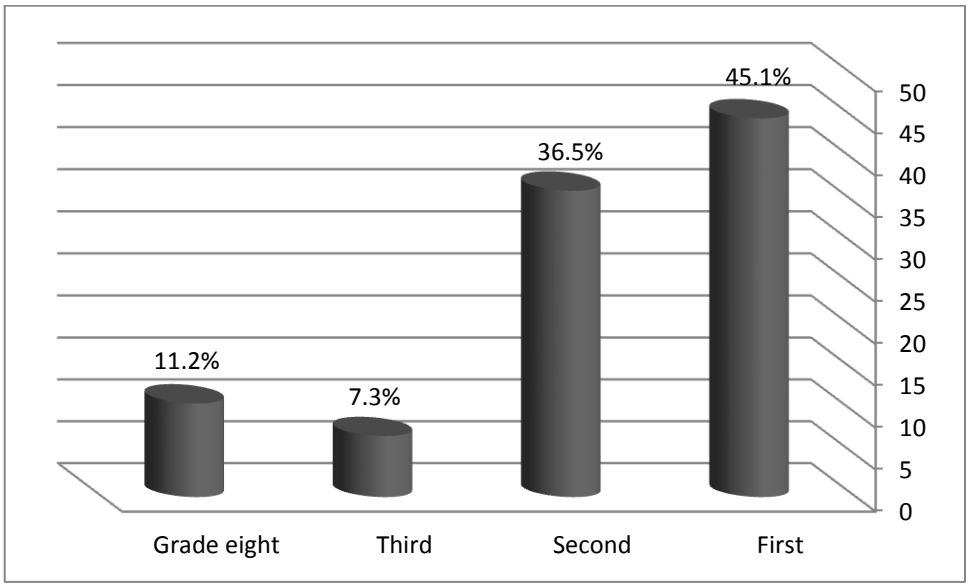
This table showed the demographic characteristics of students in study, the median age was 15 years with 1.3 std. deviations and the minimum age in the study is record as 10 years and maximum 19 years. For weight and height to check the side effect of junk food, mean weight record was 49.7Kg with std. deviation 11.4Kg and the minimum weight of students was 15 Kg and maximum 97 Kg. for the height the mean is record 149.6 Cm with std. deviation 18.5 Cm and the minimum height is record 70 Cm and maximum height was 193 Cm.

2-student grade:-

Table (2)

Grade	Frequency	Percentage %
First	173	45.1
Second	140	36.5
Third	28	7.3
Grade eight	43	11.2
Total	384	100

Figure (1)



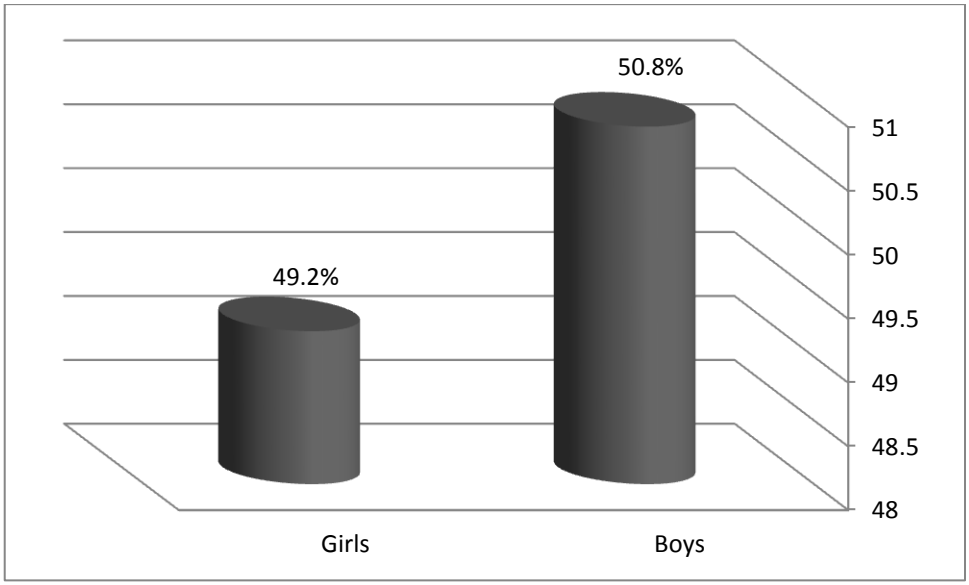
This study was targeted students in basic and secondary schools, one grade chosen from basic school represented in grade eight, and three classes, chosen from secondary school, first second and third was represented secondary schools, grade eight with 11.2% from all sample, and approximately 45.1% from first class, 36.5% from second class, and 7.3% only from total sample from third class.

3-Gender:-

Table (3)

Gender	Frequency	Percentage %
Boys	195	50.8
Girls	189	49.2
Total	384	100

Figure (2)



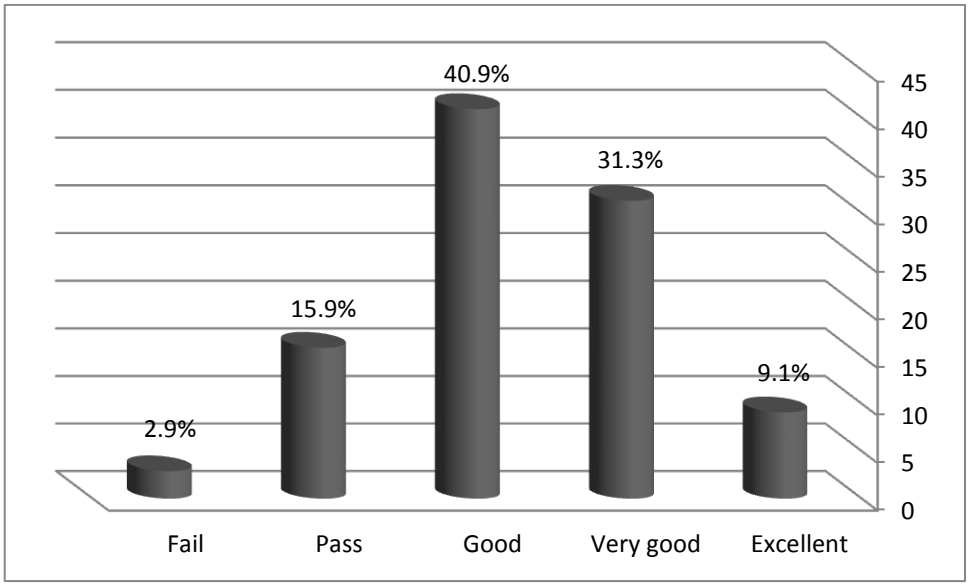
In this study the male and female are same representation, boys in school with 50.8% and girls in school with 49.2%, it given another dimension to this study, to know how junk food more affect for the boy is faster than girls or not.

4-Academic level:-

Table (4)

Level	Frequency	Percentage %
Excellent	35	9.1
Very good	120	31.3
Good	157	40.9
Pass	61	15.9
Fail	11	2.9
Total	384	100

Figure (3)



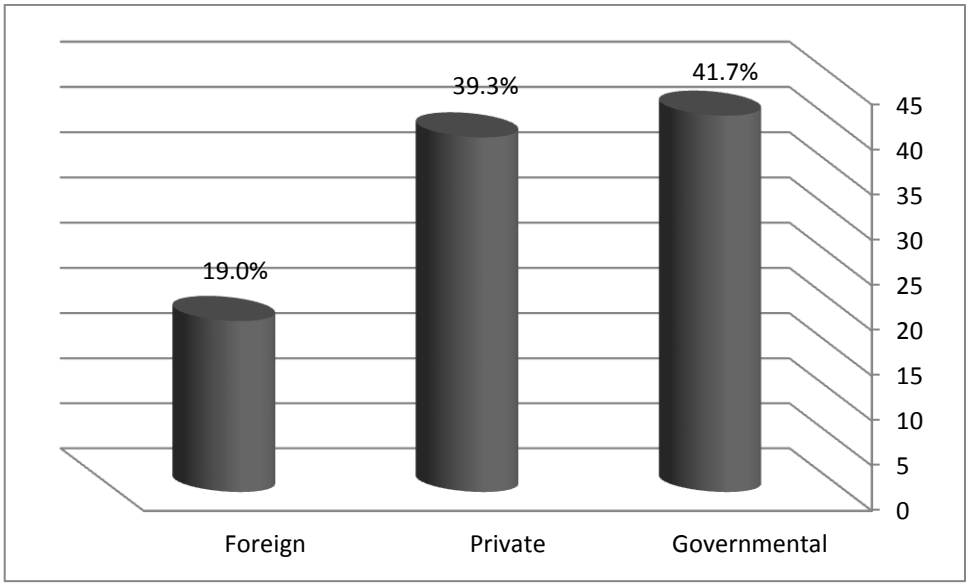
There is strongly relationship between taken junk food and academic level of students, all respondents asked, 40.9% of students have good academic level, 31.3% very good, and 15.9% pass, 9.1% excellent, just 2.9% fail.

5-Type of school:-

Table (5)

Type school	Frequency	Percentage %
Governmental	160	41.7
Private	151	39.3
Foreign	73	19.0
Total	384	100

Figure (4): type of school



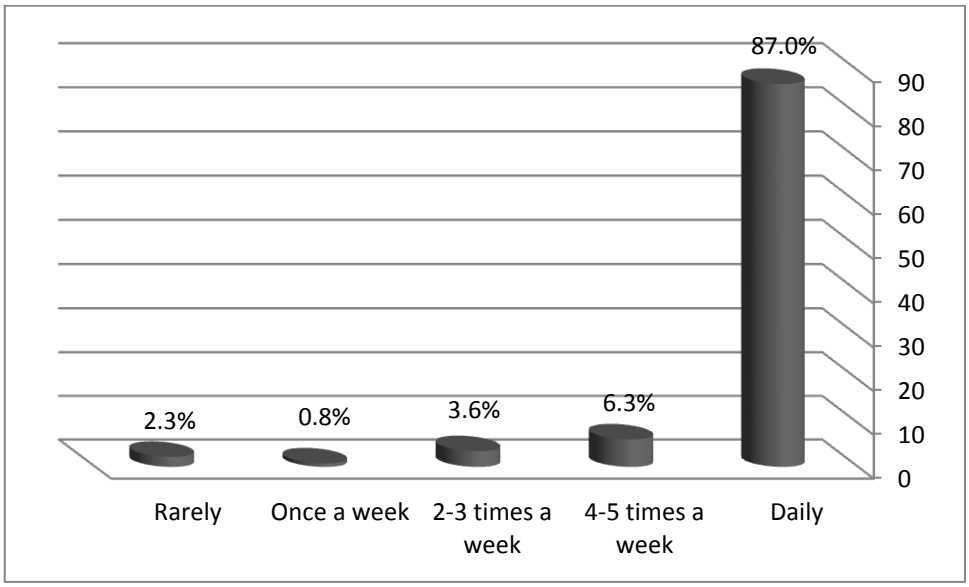
Three types of schools studied, 41.7% of respondents from governmental schools, 39.3% of respondents from private school, and 19.0% of respondents from foreign schools.

4.3 Number of breakfast eaten per week:-

Table (6)

Answer	Frequency	Percentage %
Daily	334	87.0
4-5 times a week	24	6.3
2-3 times a week	14	3.6
Once a week	3	0.8
Rarely	9	2.3
Total	384	100

Figure (5)



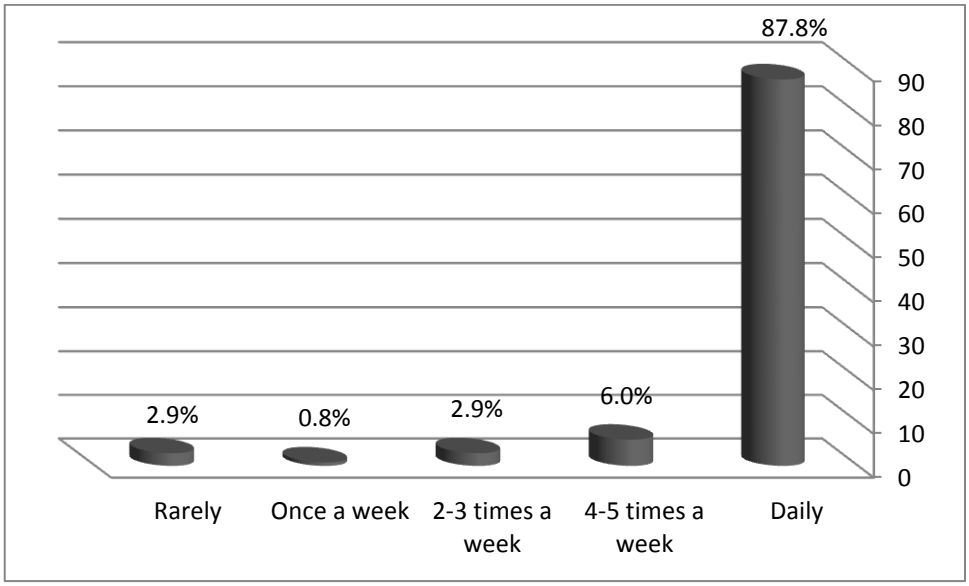
Answers of respondents are shown in above table (6) and figure (5),87.0% of respondents says daily eat breakfast, 6.3% of them eat breakfast about four to five times a week, 3.6% of respondents eat breakfast about two to three times a week, 0.8% eat breakfast once a week, and 2.3% of respondents eat breakfast rarely or never eat breakfast.

4.4 Number of lunch eaten per week:-

Table (7):

Answer	Frequency	Percentage %
Daily	337	87.8
4-5 times a week	23	6.0
2-3 times a week	11	2.9
Once a week	3	0.8
Rarely	10	2.9
Total	384	100

Figure (6)



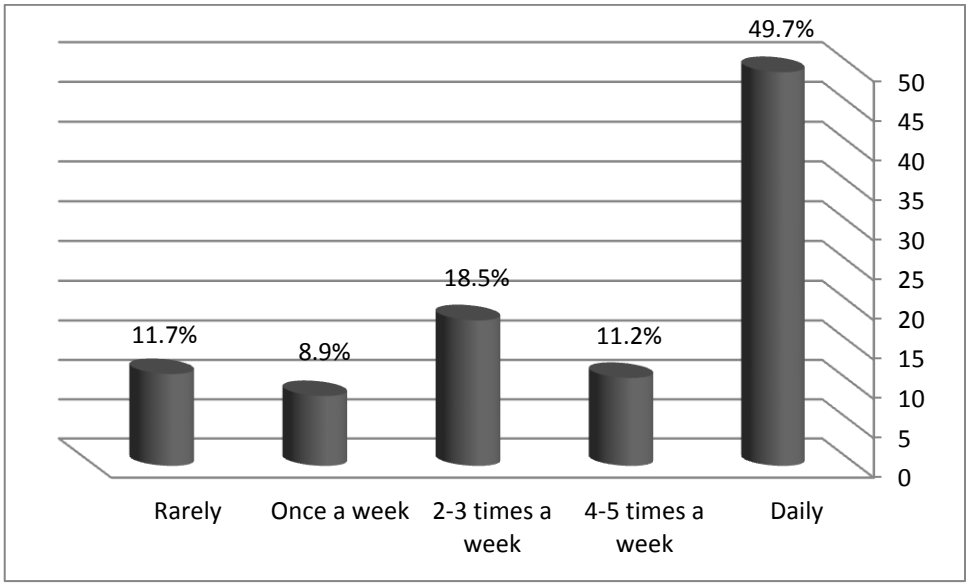
Answers of respondents are shown in above table (7) and figure (6), 87.8% of respondents says daily eat lunch, 6.0% of them eat lunch about four to five times a week, 2.9% of respondents eat lunch about two to three times a week, 0.8% eat lunch once a week, and 2.9% of respondents said rarely eat lunch.

4.5Number of dinner eaten per week:-

Table (8)

Answer	Frequency	Percentage %
Daily	191	49.7
4-5 times a week	43	11.2
2-3 times a week	71	18.5
Once a week	34	8.9
Rarely	45	11.7
Total	384	100

Figure (7)



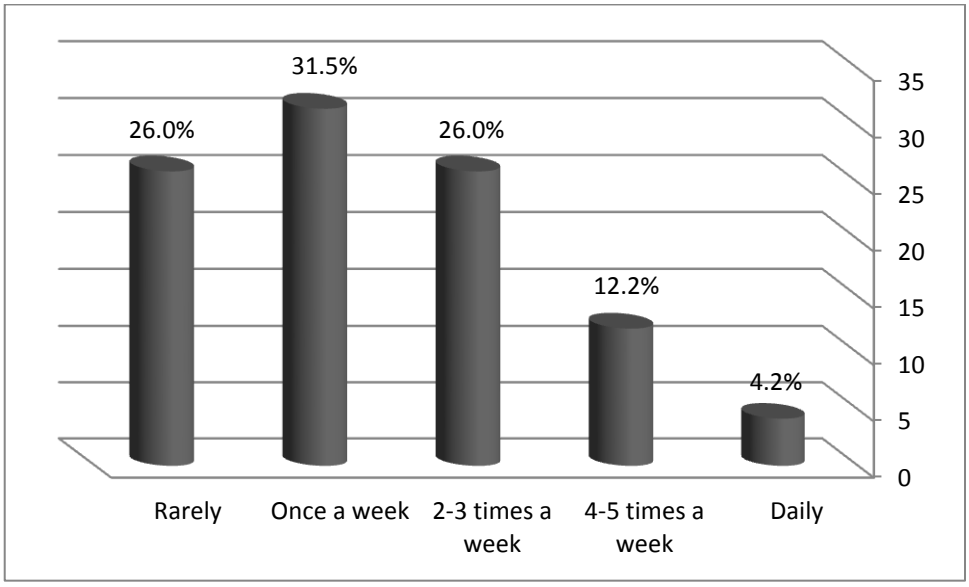
Answers of respondents are shown in above table (8) and figure (7), 87.8% of respondents says daily eat dinner, 6.0% of them eat dinner about four to five times a week, 2.9% of respondents eat dinner about two to three times a week, 0.8% eat dinner once a week, and 2.9% of respondents said rarely eat dinner.

4.6Number of fool (bush) eaten per week:-

Table (9)

Answer	Frequency	Percentage %
Daily	16	4.2
4-5 times a week	47	12.2
2-3 times a week	100	26.0
Once a week	121	31.5
Rarely	100	26.0
Total	384	100

Figure (8)



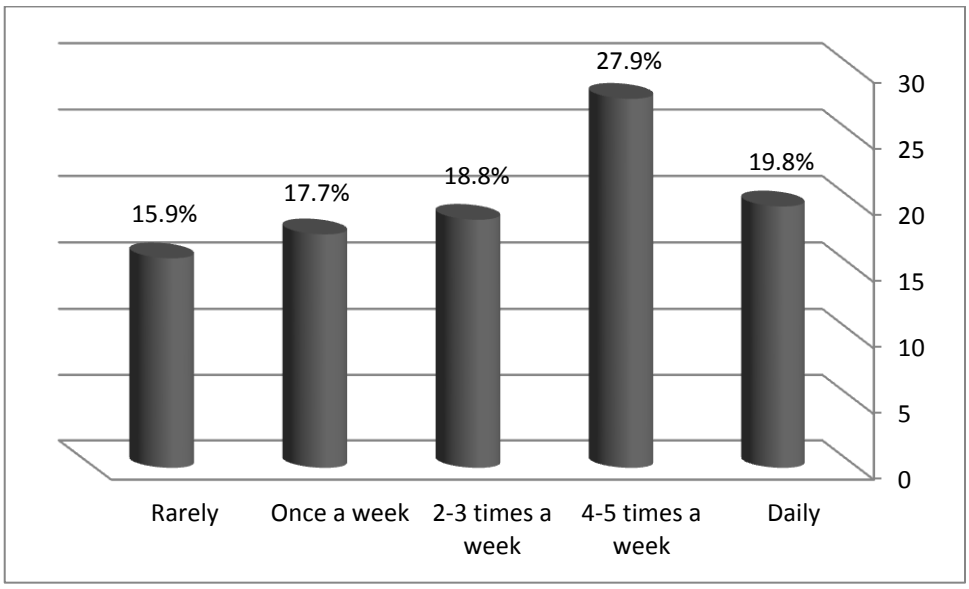
Answers of respondents are shown in above table (9) and figure (8), 4.2% of respondents says daily eat fool (bush), 12.2% of them eat fool (bush) about four to five times a week, 26.0% of respondents eat fool (bush) about two to three times a week, 31.5% eat fool (bush) once a week, and 26.0% of respondents said rarely eat fool (bush).

4.7Number of tameia eaten per week:-

Table (10)

Answer	Frequency	Percentage %
Daily	76	19.8
4-5 times a week	107	27.9
2-3 times a week	72	18.8
Once a week	68	17.7
Rarely	61	15.9
Total	384	100

Figure (9)



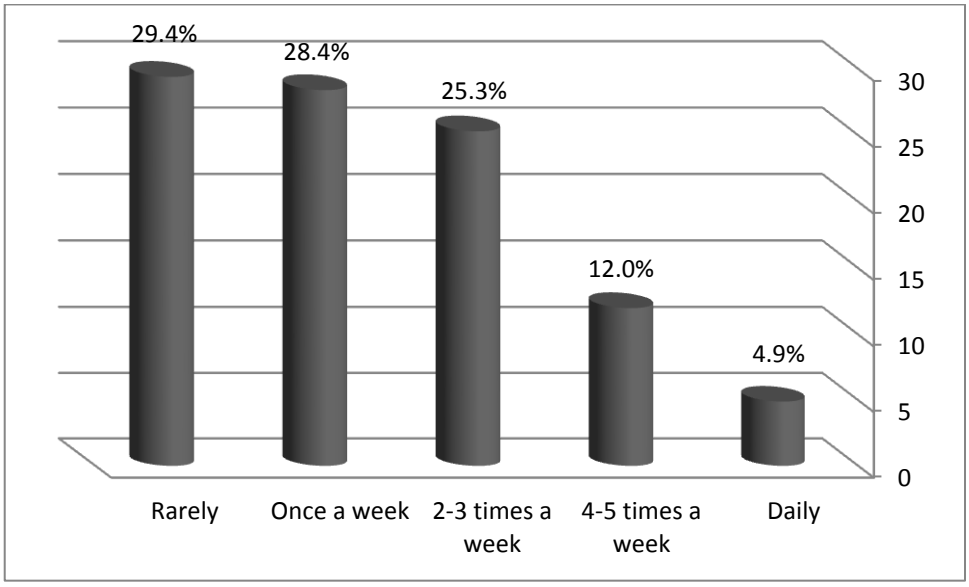
Answers of respondents are shown in above table (10) and figure (9), 19.8% of respondents says daily eat tameia, 27.9% of them eat tameia about four to five times a week, 18.8% of respondents eat tameia about two to three times a week, 17.7% eat tameia once a week, and 15.9% of respondents said rarely eat tameia.

4.8Number of eggs eaten per week:-

Table (11)

Answer	Frequency	Percentage %
Daily	19	4.9
4-5 times a week	46	12.0
2-3 times a week	97	25.3
Once a week	109	28.4
Rarely	113	29.4
Total	384	100

Figure (10)



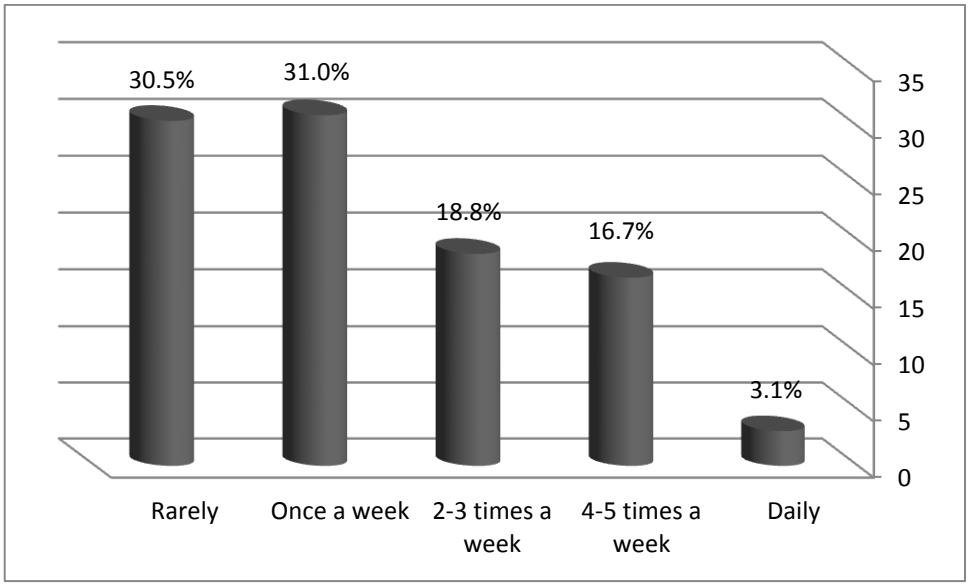
Answers of respondents are shown in above table (11) and figure (10), 4.9% of respondents says daily eat eggs, 12.0% of them eat eggs about four to five times a week, 25.3% of respondents eat eggs about two to three times a week, 28.4% eat eggs once a week, and 29.4% of respondents said rarely eat eggs.

4.9 Number of burger, hotdog, pizza, fish and chicken eaten per week:-

Table (12)

Answer	Frequency	Percentage %
Daily	12	3.1
4-5 times a week	64	16.7
2-3 times a week	72	18.8
Once a week	119	31.0
Rarely	117	30.5
Total	384	100

Figure (11)

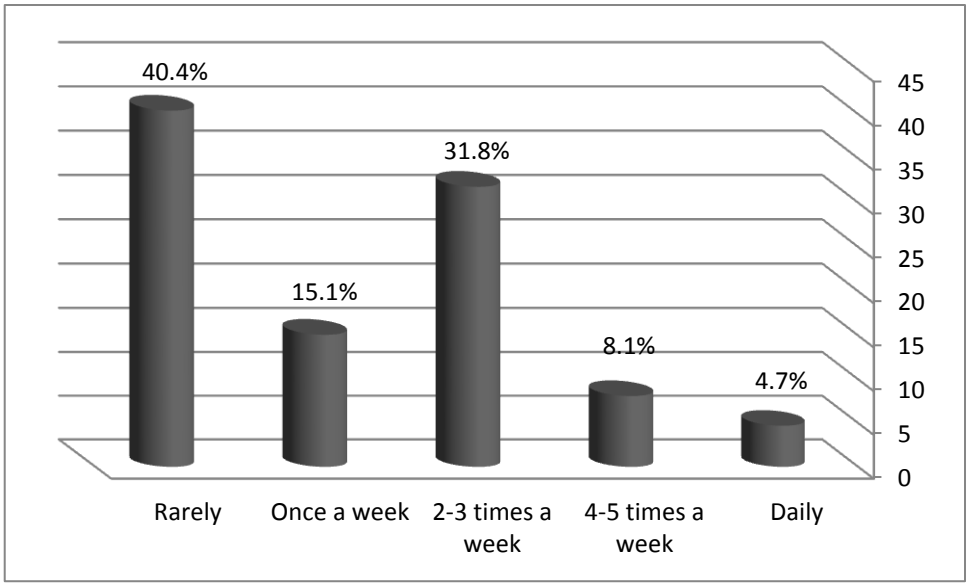


Answers of respondents are shown in above table (12) and figure (11), 3.1% of respondents says daily eat (burger, hotdog, pizza, fish, chicken, etc.), 16.7% of them eat (burger, hotdog, pizza, fish, chicken, etc.) about four to five times a week, 18.8% of respondents eat (burger, hotdog, pizza, fish, chicken, etc.) about two to three times a week, 31.0% eat (burger, hotdog, pizza, fish, chicken, etc.) once a week, and 30.5% of respondents said rarely eat (burger, hotdog, pizza, fish, chicken, etc.).

4.10Number of Andome eaten per week:-

Table (13)

Answer	Frequency	Percentage %
Daily	18	4.7
4-5 times a week	31	8.1
2-3 times a week	122	31.8
Once a week	58	15.1
Rarely	155	40.4
Total	384	100

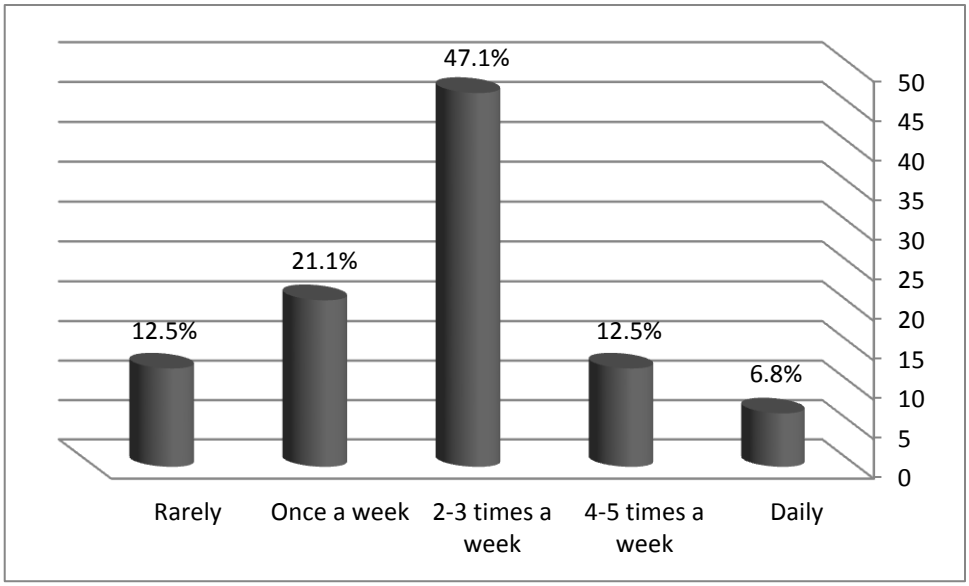


Answers of respondents are shown in above table (13) and figure (12), 4.7% of respondents says daily eat Andome, 8.1% of them eat Andome about four to five times a week, 31.8% of respondents eat Andome about two to three times a week, 15.1% eat Andome once a week, and 40.4% of respondents said rarely eat Andome.

4.11Number of potato chips eaten per week:-

Table (14)

Answer	Frequency	Percentage %
Daily	26	6.8
4-5 times a week	48	12.5
2-3 times a week	181	47.1
Once a week	81	21.1
Rarely	48	12.5
Total	384	100

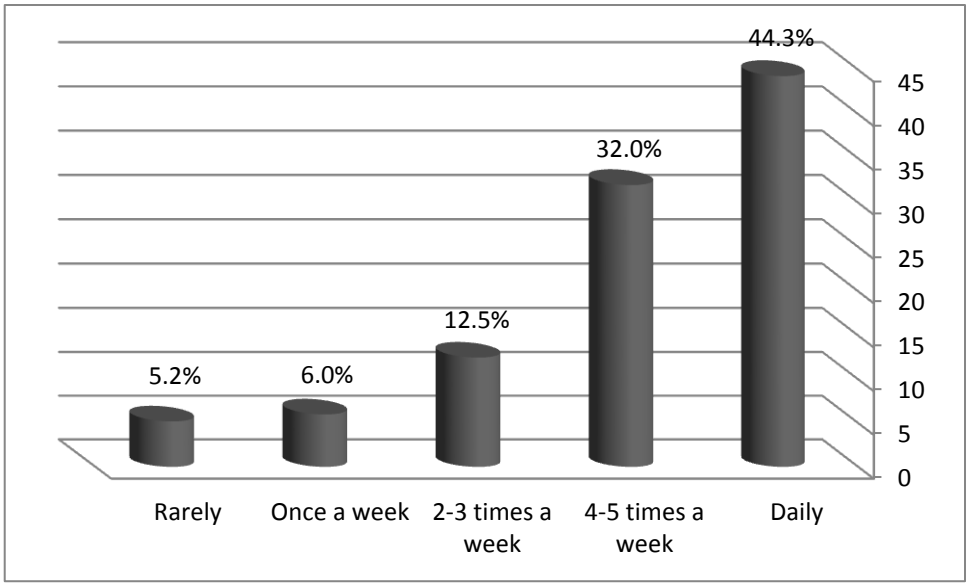


Answers of respondents are shown in above table (14) and figure (13), 6.8 of respondents says daily eat potato chips, 12.5% of them eat potato chips about four to five times a week, 47.1% of respondents eat potato chips about two to three times a week, 21.1% eat potato chips once a week, and 12.5% of respondents said rarely eat potato chips.

4.12 Number of milk drunk and cheese eaten per week:-

Table (15)

Answer	Frequency	Percentage %
Daily	170	44.3
4-5 times a week	123	32.0
2-3 times a week	48	12.5
Once a week	23	6.0
Rarely	20	5.2
Total	384	100

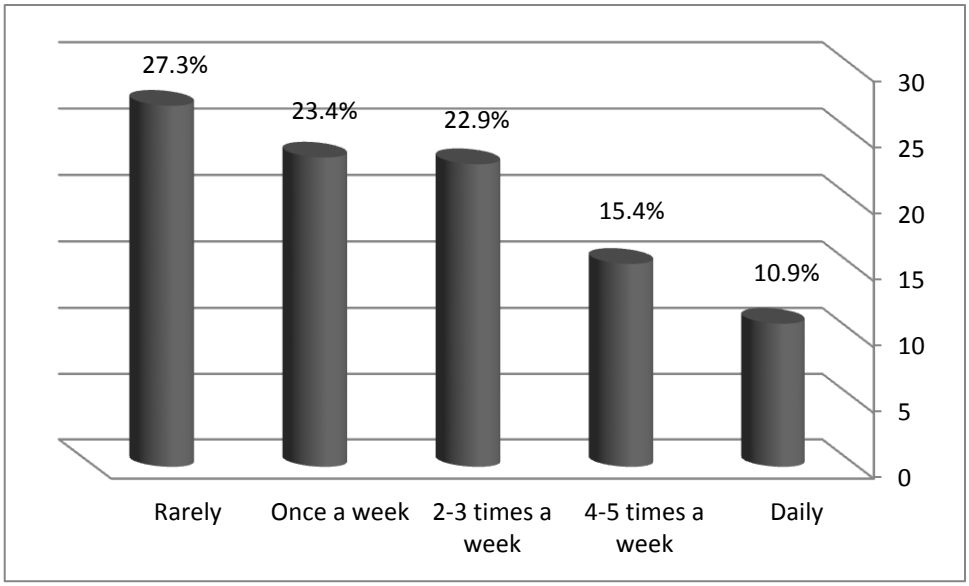


Answers of respondents are shown in above table (15) and figure (14), 44.3% of respondents says daily eat dairy products (milk, cheese, etc.), 32.0% of them eat dairy products (milk, cheese, etc.) about four to five times a week, 12.5% of respondents eat dairy products (milk, cheese, etc.) about two to three times a week, 6.0% eat dairy products (milk, cheese, etc.) once a week, and 5.2% of respondents said rarely eat dairy products (milk, cheese, etc.).

4.13 Number of fruits eaten per week:-

Table (16)

Answer	Frequency	Percentage %
Daily	42	10.9
4-5 times a week	59	15.4
2-3 times a week	88	22.9
Once a week	90	23.4
Rarely	105	27.3
Total	384	100

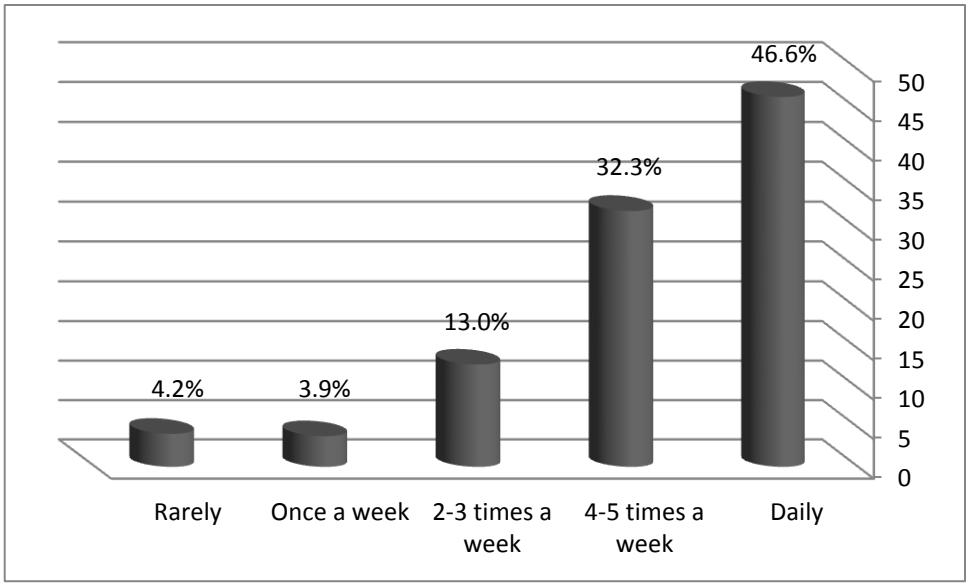


Answers of respondents are shown in above table (16) and figure (15), 10.9% of respondents says daily eat fruits (fresh or canned), 15.4% of them eat fruits (fresh or canned) about four to five times a week, 22.9% of respondents eat fruits (fresh or canned) about two to three times a week, 23.4% eat fruits (fresh or canned) once a week, and 27.3% of respondents said rarely eat fruits (fresh or canned).

4.14 Number of vegetables or salad eaten per week:-

Table (17)

Answer	Frequency	Percentage %
Daily	179	46.6
4-5 times a week	124	32.3
2-3 times a week	50	13.0
Once a week	15	3.9
Rarely	16	4.2
Total	384	100

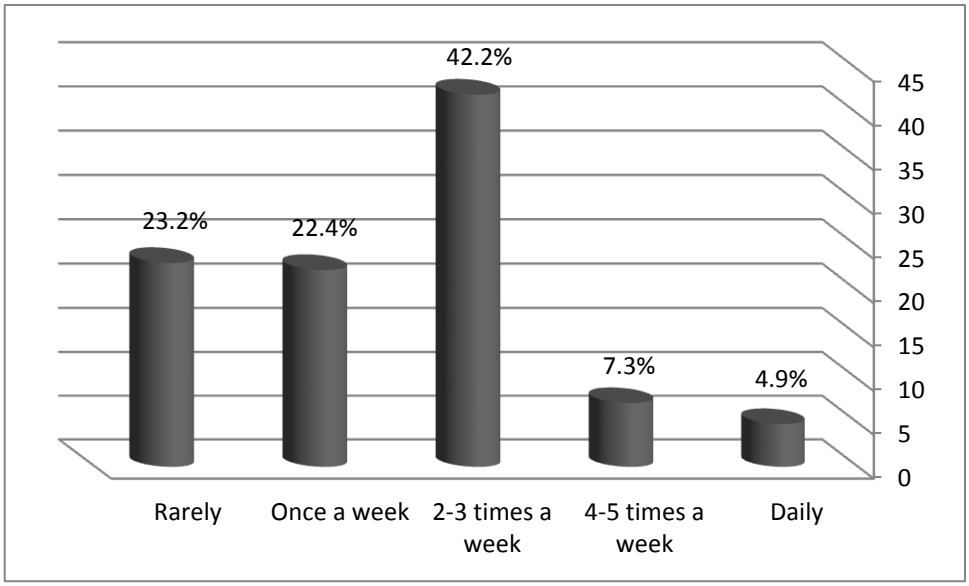


Answers of respondents are shown in above table (17) and figure (16), 46.6% of respondents says daily eat vegetables or salad, 32.3% of them eat vegetables or salad about four to five times a week, 13.0% of respondents eat vegetables or salad about two to three times a week, 3.9% eat vegetables or salad once a week, and 4.2% of respondents said rarely eat vegetables or salad.

4.15 Number of chips eaten per week:-

Table (18)

Answer	Frequency	Percentage %
Daily	19	4.9
4-5 times a week	28	7.3
2-3 times a week	162	42.2
Once a week	86	22.4
Rarely	89	23.2
Total	384	100

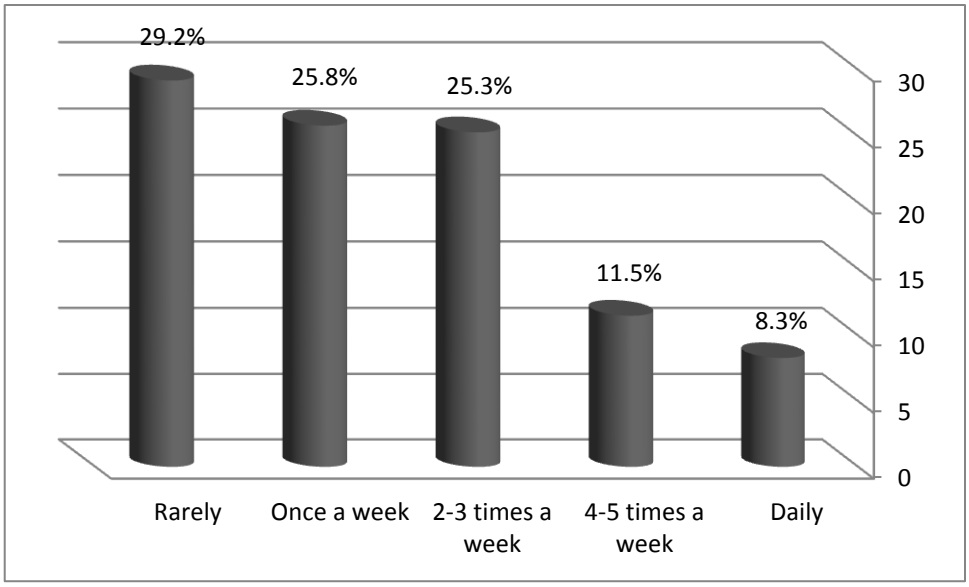


Answers from respondents are shown here in above table (18) and figure (17), 4.9% of respondents says daily eat chips and related, 7.3% of them eat chips and related about four to five times a week, 42.2% of respondents eat chips and related about two to three times a week, 22.4% eat chips and related once a week, and 23.2% of respondents said rarely eat chips and related.

4.16Number of sweets eaten per day:-

Table (19)

Answer	Frequency	Percentage %
Daily	32	8.3
4-5 times a week	44	11.5
2-3 times a week	97	25.3
Once a week	99	25.8
Rarely	112	29.2
Total	384	100

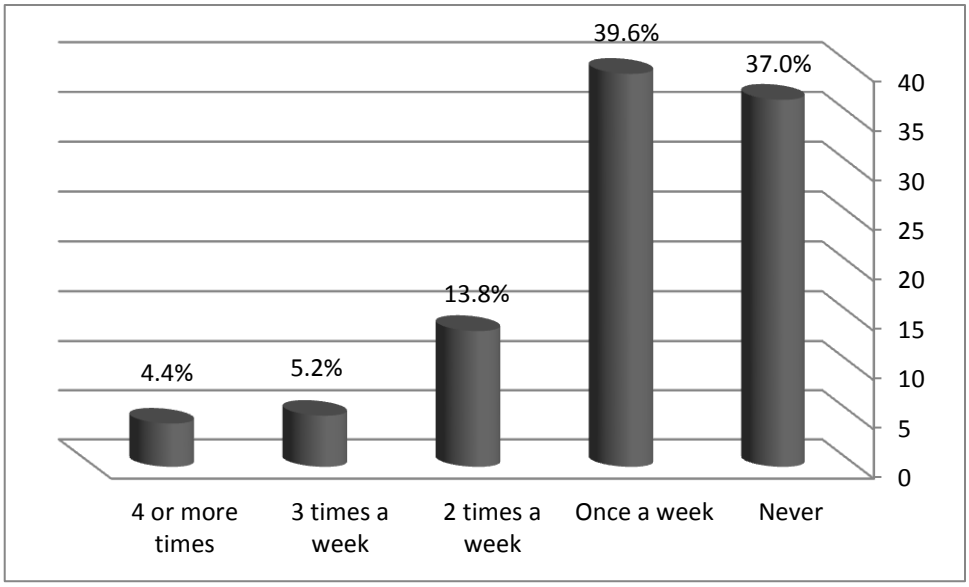


Answers from respondents are shown here in above table (19) and figure (18), 8.3% of respondents says daily eat (chocolate, cake, ice cream, etc.) per day, 11.5% of them eat (chocolate, cake, ice cream, etc.) per day about four to five times a week, 25.3% of respondents eat (chocolate, cake, ice cream, etc.) per day about two to three times a week, 25.8% eat (chocolate, cake, ice cream, etc.) per day once a week, and 29.2% of respondents said rarely eat (chocolate, cake, ice cream, etc.) per day.

4.17 Number of carbonated beverages drunk per day:-

Table (20)

Answer	Frequency	Percentage %
Never	142	37.0
Once a week	152	39.6
2 times a week	53	13.8
3 times a week	20	5.2
4 or more times	17	4.4
Total	384	100

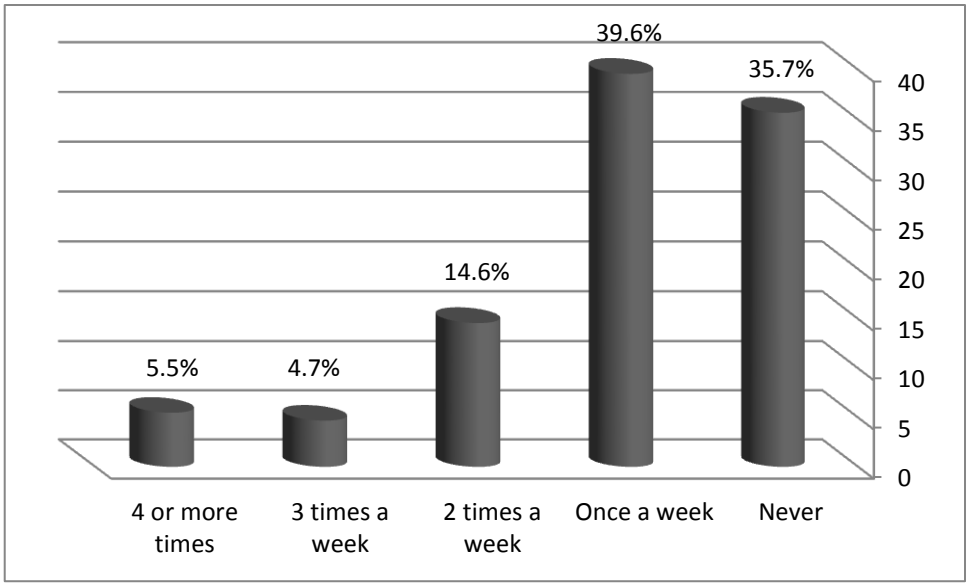


Answers of respondents are shown in above table (20) and figure (19), 37.0% of respondents says there is never drank any carbonated beverages like (Pepsi – Cola – Fanta – etc.), 39.6% of them drank (Pepsi – Cola – Fanta – etc.) once a week, 13.8% of respondents drank (Pepsi – Cola – Fanta – etc.) 2 times a week, 5.2% drank (Pepsi – Cola – Fanta – etc.) 3 times a week, and 4.4% of respondents said drank (Pepsi – Cola – Fanta – etc.) 4 or more times a week.

4.18Number of carbonated fruit juice drunk per day:-

Table (21)

Answer	Frequency	Percentage %
Never	137	35.7
Once a week	152	39.6
2 times a week	56	14.6
3 times a week	18	4.7
4 or more times	21	5.5
Total	384	100



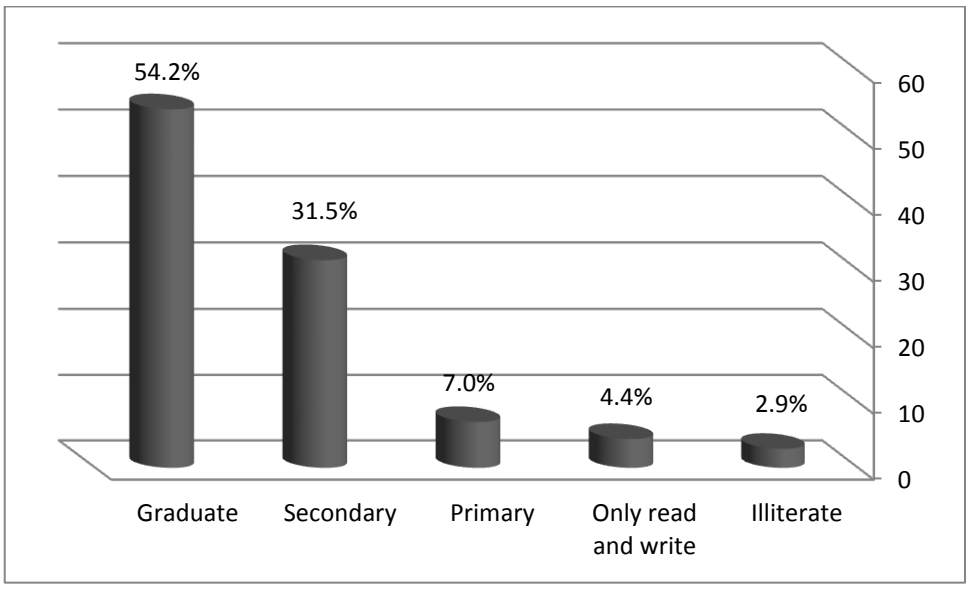
Answers of respondents are shown in above table (21) and figure (20), 35.7% of respondents says there is never drank any carbonated beverages like (orange – mango – etc.), 39.6% of them drank (orange – mango – etc.) once a week, 14.6% of respondents drank (orange – mango – etc.) 2 times a week, 4.7% drank (orange – mango – etc.) 3 times a week, and 5.5% of respondents said drank (orange – mango – etc.) 4 or more times a week.

4.19The effect of parent's education in selected of kind of food:-

1-Education level of mother:-

Table (22)

Answer	Frequency	Percentage %
Illiterate	11	2.9
Only read and write	17	4.4
Primary	27	7.0
Secondary	121	31.5
Graduate	208	54.2
Total	384	100

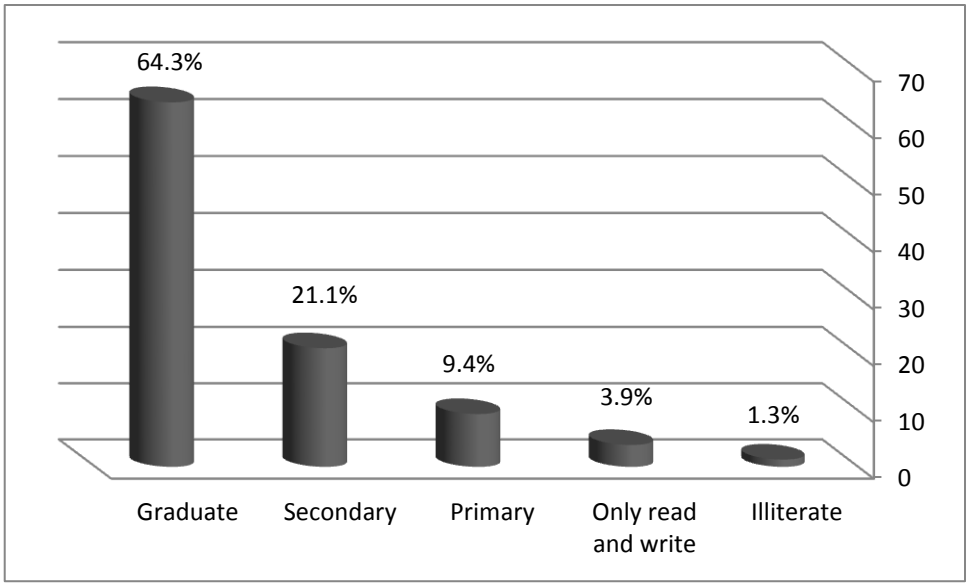


The parent's education is affect in selected of kind of food, what is the mother education? 2.9% of mother her illiterate, 4.4% of them just read and write only, 7.0% of them was primary, 31.5% was secondary, and 54.2% of them was graduate. This implies more than half sample have graduate level and reflect to how often mother chose a food for her boy/girl.

2-Education level of father:-

Table (23)

Answer	Frequency	Percentage %
Illiterate	5	1.3
Only read and write	15	3.9
Primary	36	9.4
Secondary	81	21.1
Graduate	247	64.3
Total	384	100



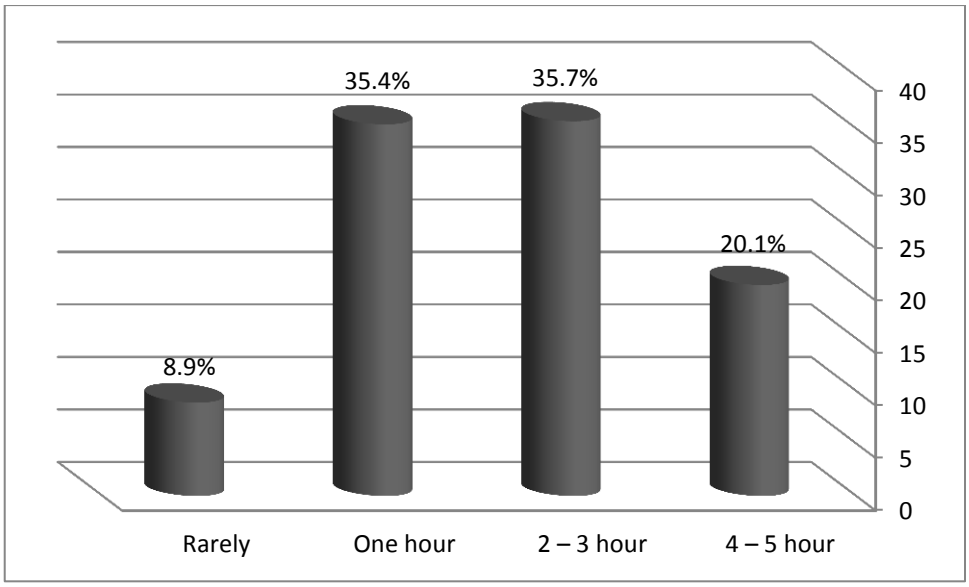
The parent's education is affect in selected of kind of food, what is the father education? 1.3% of father her illiterate, 3.9% of them just read and write only, 9.4% of them was primary, 21.1% was secondary, and 64.3% of them was graduate.

4.20The impact of activities due to meal taken:-

1-Number of hours per day usually students spend to watch TV shows or videos.

Table (24)

Answer	Frequency	Percentage %
4 – 5 hour	77	20.1
2 – 3 hour	137	35.7
One hour	136	35.4
Rarely	34	8.9
Total	384	100

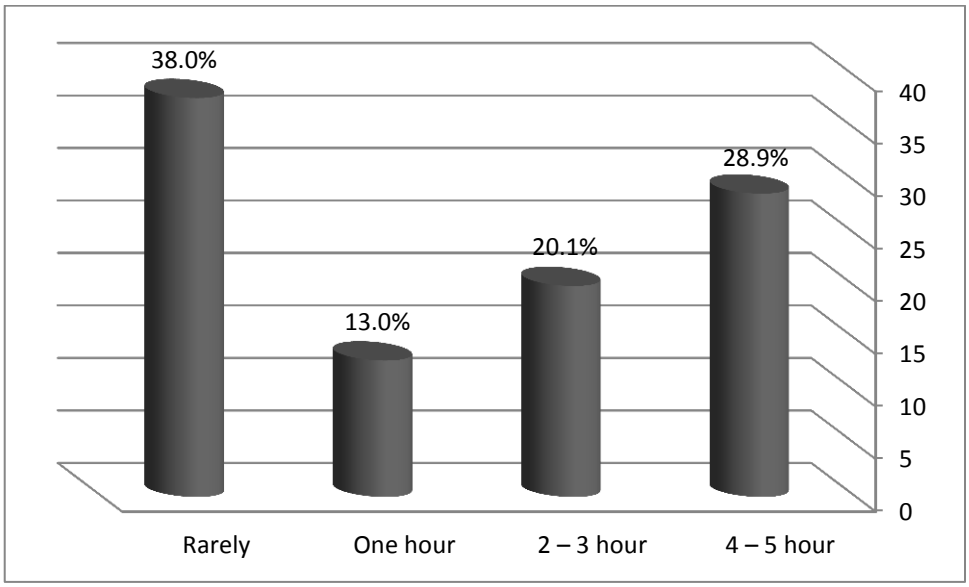


During the week, how many hours per day do you usually spend watching TV shows or videos, 20.1% of respondents said 4-5 hour spent watching TV shows or videos, 35.7% of respondents said 2-3 hour spent watching TV shows or videos, 35.4% of respondents said one hour spent watching TV shows or videos, 8.9% of respondents rarely watching TV shows or videos.

2-Number of hours per day usually students spend to do exercise or anticipate in sports activities:-

Table (25)

Answer	Frequency	Percentage %
4 – 5 hour	111	28.9
2 – 3 hour	77	20.1
One hour	50	13.0
Rarely	146	38.0
Total	384	100

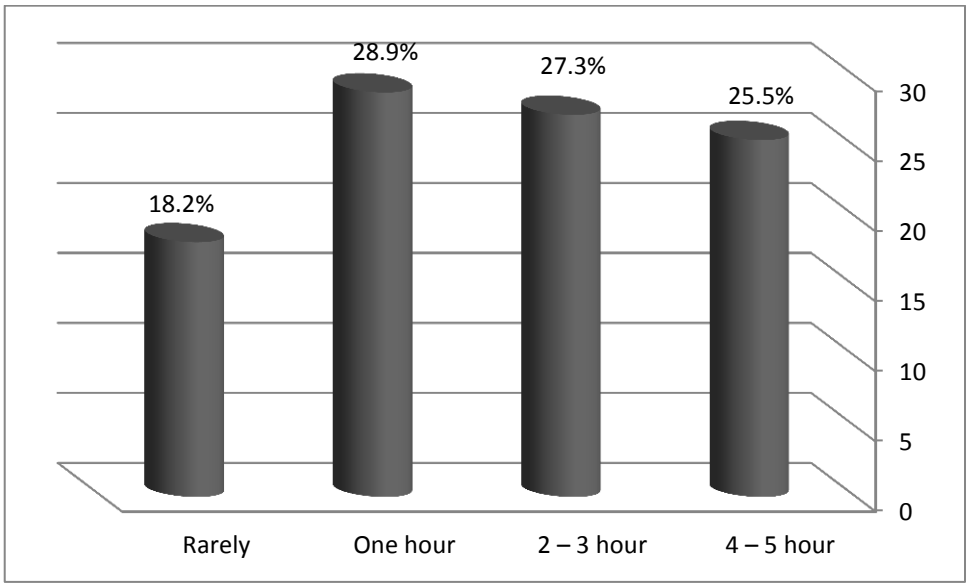


During the week, how many hours per day do you exercise or participate in sports activities, 28.9% of respondents said 4-5 hour participate in sports activities, 20.1% of respondents said 2-3 hour participate in sports activities, 13.0% of respondents said one hour participate in sports activities, 38.0% of respondents rarely participate in sports activities.

3-Number of hours per day usually students spend to use mobile in asocial media or to see games or videos:-

Table (26)

Answer	Frequency	Percentage %
4 – 5 hour	98	25.5
2 – 3 hour	105	27.3
One hour	111	28.9
Rarely	70	18.2
Total	384	100



During the week, how many hours per day do you exercise or participate in sports activities, 28.9% of respondents said 4-5 hour participate in sports activities, 20.1% of respondents said 2-3 hour participate in sports activities, 13.0% of respondents said one hour participate in sports activities, 38.0% of respondents rarely participate in sports activities.

4.21The effect of nutrition knowledge in junk food:-

Table (27)

No	Question	Yes	No
1	Breakfast is the most important meal of the day	336 87.5%	48 12.5%
2	The main function of protein- rich foods is to build muscles	339 88.3%	45 11.7%
3	The main function of starchy foods is to provide energy	305 79.4%	79 20.6%
4	The main function of dairy products is to build strong teethand bones	321 83.6%	63 16.4%
5	One of the main function of vegetables is protecting against infections	291 75.8%	93 24.2%
6	Six or more glasses of water should be drunk daily	312 81.3%	72 18.6%
7	Oranges help to heal sores (vitamin C)	313 81.5%	71 18.5%
8	Vegetables and fruits and dairy are starchy foods	156 40.6%	228 59.4%
9	Foods that should be restricted (sugar foods such as sweets foods, containing a high amount of salt, such as processed foods, and fats, such as fried foods, oil)	249 64.8%	135 35.2%
10	Protein-rich foods (including meat, fish, chicken, dried beans, peas, soy and legumes)	297 77.3%	87 22.7%

The effect of nutrition knowledge in junk food, this table shows the respondents answer about the nutrition knowledge in junk food, 87.5% said

the Breakfast is the most important meal of the day, and others is not. 88.3% said the main function of protein- rich foods is to build muscles. 79.4% said the main function of starchy foods is to provide energy. 83.6% said the main function of dairy products is to build strong teeth and bones. 75.8% said one of the main function of vegetables is protecting against infections. 81.3% six or more glasses of water should be drunk daily. 81.5% said Oranges help to heal sores (vitamin C). 59.4% said Vegetables and fruits and dairy aren't starchy foods. 64.8% said Foods that should be restricted (sugar foods such as sweets foods, containing a high amount of salt, such as processed foods, and fats, such as fried foods, oil). 77.3% said Protein-rich foods (including meat, fish, chicken, dried beans, peas, soy and legumes).

4.22Hypotheses testing:-

1-The types of meals eaten by students is relationship with demography characteristics (grade):-

Table (28)

No	Food frequency	What grade are you in (grade 8, first, second, third)	
		Chi-square	Sig
1	how often do you eat breakfast	44.646	0.000
2	how often do you eat lunch	33.965	0.001
3	how often do you eat dinner	11.542	0.483
4	how often do you eat fool (bush)	22.145	0.036
5	how often do you eat Tamea	50.491	0.000
6	how often do you eat eggs	29.037	0.004
7	how often do you eat burger, hot dog, pizza, etc	40.895	0.000
8	how often do you eat Andome	25.193	0.014
9	how often do you eat potato chips	37.065	0.000
10	how often do you eat dairy products (milk, cheese, etc)	21.188	0.048
11	how often do you eat fruits (fresh or canned)	38.775	0.000
12	how often do you eat vegetables or salad	30.844	0.002
13	Chips and related	43.578	0.000
14	How many sweets (chocolate, cake, etc) do you eat per day	31.427	0.002

Chi-square test was use to find there is a relationship between food frequency and students grade, the table (28) shows the results, the meal eaten by the student has high significant according to grade this mean the students in grade eight or in first class, second or third class has differences in how to take breakfast, lunch, fool (bush), tamea, eggs, burger, hotdog, pizza, andome, potato chips, dairy products (milk- cheese), fruits, vegetables or salad, chips and related, sweets (chocolate – cake). Except dinner all respondents has same answer and no differences between them about it.

2-The types of meals eaten by students is relationship with demography characteristics (gender):-

Table (29)

No	Food frequency	Are you a boy or a girl	
		Chi-square	Sig
1	how often do you eat breakfast	4.908	0.297
2	how often do you eat lunch	3.792	0.435
3	how often do you eat dinner	12.310	0.015
4	how often do you eat fool (bush)	40.817	0.000
5	how often do you eat Tamea	14.595	0.006
6	how often do you eat eggs	7.294	0.121
7	how often do you eat burger, hot dog, pizza, etc.	13.451	0.009
8	how often do you eat Andome	16.570	0.002
9	how often do you eat potato chips	13.756	0.008
10	how often do you eat dairy products (milk, cheese, etc.)	6.283	0.179
11	how often do you eat fruits (fresh or canned)	22.717	0.000
12	how often do you eat vegetables or salad	9.065	0.060
13	Chips and related	17.070	0.002
14	How many sweets (chocolate, cake, etc.) do you eat per day	19.248	0.001

There is no differences between gender (boy – girl) and food frequency in some kind like breakfast, lunch, eggs, dairy products, vegetables and salad

this means boy or girl has no preferred all food frequencies mentioned, but has highly significant in dinner. Fool (bush), tamea, burger, hotdog, pizza, andome, potato chips, fruits, chips and related, sweets (chocolate – cake). This means the boys is eaten this type of foods differently from eaten by girls.

3-The types of meals eaten by students is relationship with demography characteristics (academic level):-

Table (30)

No	Food frequency	Academic level	
		Chi-square	Sig
1	how often do you eat breakfast	49.184	0.000
2	how often do you eat lunch	16.317	0.431
3	how often do you eat dinner	18.792	0.280
4	how often do you eat fool (bush)	24.232	0.085
5	how often do you eat Tamea	37.832	0.002
6	how often do you eat eggs	30.401	0.016
7	how often do you eat burger, hot dog, pizza, etc	19.732	0.233
8	how often do you eat Andome	19.822	0.228
9	how often do you eat potato chips	33.738	0.006
10	how often do you eat dairy products (milk, cheese, etc)	11.450	0.775
11	how often do you eat fruits (fresh or canned)	45.775	0.000
12	how often do you eat vegetables or salad	33.133	0.007
13	Chips and related	31.424	0.012
14	How many sweets (chocolate, cake, etc) do you eat per day	32.069	0.010

There is no differences between academic level (excellent – very good – good – pass - fail) and food frequency in some kind like lunch, dinner, fool (bush), burger – hot dog - pizza, Andome, dairy products (milk – cheese), this means according to academic level students has preferred all food frequencies mentioned, but has highly significant in breakfast, tamea, eggs, potato chips, fruits, vegetables and salad, chips and related, sweets (chocolate – cake – ice cream) This means the boys is eaten this type of foods differently from eaten by girls.

4-The types of meals eaten by students is relationship with demography characteristics (type of school):-

Table (31)

No	Food frequency	type of school	
		Chi-square	Sig
1	how often do you eat breakfast	18.348	0.019
2	how often do you eat lunch	7.558	0.478
3	how often do you eat dinner	10.719	0.218
4	how often do you eat fool (bush)	16.738	0.033
5	how often do you eat Tamea	110.476	0.000
6	how often do you eat eggs	10.553	0.228
7	how often do you eat burger, hot dog, pizza, etc.	99.342	0.000
8	how often do you eat Andome	16.027	0.042
9	how often do you eat potato chips	10.907	0.207
10	how often do you eat dairy products (milk, cheese, etc.)	6.815	0.557
11	how often do you eat fruits (fresh or canned)	37.889	0.000
12	how often do you eat vegetables or salad	9.655	0.290
13	Chips and related	35.426	0.000
14	How many sweets (chocolate, cake, etc.) do you eat per day	33.142	0.000

There is no differences between type of school (governmental – private– foreign) and food frequency in some kind like lunch, dinner, eggs, potato

chips, dairy products (milk – cheese), vegetables and salad, this means according to type of school students has preferred all food frequencies mentioned, but has highly significant in breakfast, fool (bush), tamea, burger – hot dog - pizza, Andome, fruits, chips and related, sweets (chocolate – cake – ice cream) This means the boys is eaten this type of foods differently from eaten by girls.

5-There is big different in drinking held by students and parents education:-

Table (32)

No	Beverage frequency	Education of parents			
		Education level of mother		Education level of father	
		Chi-square	Sig	Chi-square	Sig
1	How many carbonated beverages do you drink per day	27.211	0.039	56.174	0.000
2	How many fruit juice do you drink per day	51.268	0.000	402.981	0.000

The education level of parents is high significances with beverage frequency, for all mothers and fathers education level, this means mothers students had good care for her students for carbonated beverages drank and fruit juice do you drank, also fathers doing same.

6-The parent's education related on knowledge in junk food:-

Table (33)

No	Question	Education of parents			
		Education level of mother		Education level of father	
		Chi-square	Sig	Chi-square	Sig
1	Breakfast is the most important meal of the day	4.981	0.289	11.219	0.047
2	The main function of protein- rich foods is to build muscles	5.745	0.219	18.287	0.003
3	The main function of starchy foods is to provide energy	1.880	0.758	5.759	0.330
4	The main function of dairy products is to build strong teethand bones	4.322	0.364	3.433	0.634
5	One of the main function of vegetables is protecting against infections	5.001	0.287	6.306	0.278
6	Six or more glasses of water should be drunk daily	7.793	0.099	9.089	0.106
7	Oranges help to heal sores (vitamin C)	0.751	0.945	1.707	0.888
8	Vegetables and fruits and dairy are starchy foods	13.240	0.010	20.941	0.001
9	Foods that should be restricted (sugar foods such as sweets foods, containing a high amount of salt, such as processed foods, and fats, such as fried foods, oil)	1.550	0.816	4.850	0.434
10	Protein-rich foods (including meat, fish, chicken, dried beans, peas, soy and legumes)	2.269	0.686	5.760	0.330

The parent's education related on knowledge in junk food, there is no differences in education level of mother students and junk food Knowledge, except Vegetables and fruits and dairy are starchy foods. For father education level and junk food Knowledge also there is no differences except Breakfast

is the most important meal of the day, The main function of protein- rich foods is to build muscles, Vegetables and fruits and dairy are starchy foods

7-The parent's education to select kind of food and the impact of activities due to take meal :-

Table (34)

No	Activities	Education of parents			
		Education level of mother		Education level of father	
		Chi-square	Sig	Chi-square	Sig
1	How many hours per day do you usually spend watching TV or videos	11.793	0.462	11.321	0.730
2	How many hours per day do you exercise or participate in sports activities	15.349	0.223	42.638	0.000
3	How many hours per day do you use mobile in a social media or to watch games or videos	24.934	0.015	34.833	0.003

The parent's education to select kind of food and the impact of activities due to take meal, about watching TV or videos mother education level and father education level are same no differences that is mean education level of parents not effects of watching TV or videos. But for exercise or participate in sports activities the education level of mother no differences in other hand there is big different in father education level about this matter. For using mobile in a social media or to watch games or videos there is highly significance different in parent's education level.

Questionnaire

1. What grade are you in? _____

2. How old are you? _____ years old

3. Are you a boy or a girl? Boy ☐ Girl ☐

Weight ☐ Height ☐

Academic level ☐

Type of school: governmental ☐ private ☐ Foreign ☐

The normal types of meals eaten during the day

No	Food Frequency	Daily	4-5 times a week	2-3 times a week	Once a week	Rarely
1	How often do you eat breakfast?					
2	How often do you eat lunch?					
3	How often do you eat dinner?					
4	How often do you eat fool(bush)					
5	How often do you eat Tamea					
6	How often do you eat eggs					
7	How often do you eat Burger (Hot dog, pizza, fish ,chicken etc)					
8	How often do you eat Andome)					
9	How often do you eat					

	potato chips					
10	How often do you eat dairy products? (milk, cheese, etc.)					
11	How often do you eat fruits? (fresh or canned)					
12	How often do you eat vegetables or salad?					
13	Chips and related					
14	How many sweets do you eat per day?(chocolate, cake ,ice cream others)					

There is big different in Drinking held by students

Beverage Frequency	**4 or more**	**3**	**2**	**1**	**None**
How many carbonated beverages do you drink per day?(pepsi ,cola ,fantaetc					
How many fruit juice do you drink per day?(orange, mango etc					

The parent's education is affect in selected of kind food

Education of parents	Illiterate	Only read and write	Primary education	Secondary level education	Graduate
educational of mother					
educational of father					

The effect of Nutrition knowledge in junk food

Question	Yes	No
Breakfast is the most important meal of the day.		
The main function of protein-rich foods is to build muscles.		
The main function of starchy foods is to provide energy.		
The main function of dairy products is to build strong teeth and bones.		

One of the main functions of vegetables is protecting against infections.		
Six or more glasses of water should be drunk daily.		
Oranges help to heal sores (Vitamin C).		
Vegetables and fruit and Dairy (including milk and eggs) are Starchy foods.		
Foods that should be restricted (sugary foods such as sweets, foods containing a high amount of salt, such as processed foods, and fats, such as fried foods, oils)		
Protein-rich foods (including meat, fish, chicken, dried beans, peas, soy and legumes)		

The impact of Activities due to take meal

	4-5 hour	2-3 hour	1 hour	rarely
During the week, how many hours per day do you usually spend watching TV shows or videos?				
During the week, how many hours per day do you exercise or participate in sports activities				
how many hours per day do you do you use mobile in asocial media or to see games or videos				

Chapter five

Results:-

By Chi-square test we find there is a relationship between food frequency and students grade, that means the meal eaten by the student has high significant according to grade this mean the students in grade eight or in first class, second or third class has differences in how to take breakfast, lunch, fool (bush), tamea, eggs, burger, hotdog, pizza, andome, potato chips, dairy products (milk- cheese), fruits, vegetables or salad, chips and related, sweets (chocolate – cake). Except dinner all respondents has same answer and no differences between them about it, there is no differences between gender (boy – girl) and food frequency in some kind like breakfast, lunch, eggs, dairy products, vegetables and salad this means boy or girl has no preferred all food frequencies mentioned, but has highly significant in dinner. Fool (bush), tamea, burger, hotdog, pizza, andome, potato chips, fruits, chips and related, sweets (chocolate – cake). This means the boys is eaten this type of foods differently from eaten by girls, there is no differences between academic level (excellent – very good – good – pass - fail) and food frequency in some kind like lunch, dinner, fool (bush), burger – hot dog - pizza, Andome, dairy products (milk – cheese), this means according to academic level students has preferred all food frequencies mentioned, but has highly significant in breakfast, tamea, eggs, potato chips, fruits, vegetables and salad, chips and related, sweets (chocolate – cake – ice cream) This means the boys is eaten this type of foods differently from eaten by girls, there is no differences between type of school (governmental – private– foreign) and food frequency in some kind like lunch, dinner, eggs, potato chips, dairy products (milk – cheese), vegetables and salad, this means according to type of school students has preferred all food frequencies mentioned, but has highly significant in breakfast, fool (bush), tamea, burger – hot dog - pizza, Andome, fruits, chips and related, sweets (chocolate – cake – ice cream) This means the boys is eaten this type of foods differently from eaten by girls, the education level of

parents is high significances with beverage frequency, for all mothers and fathers education level, this means mothers students had good care for her students for carbonated beverages drank and fruit juice do you drank, also fathers doing same, the parent's education related on knowledge in junk food, there is no differences in education level of mother students and junk food Knowledge, except Vegetables and fruits and dairy are starchy foods. For father education level and junk food Knowledge also there is no differences except Breakfast is the most important meal of the day, The main function of protein- rich foods is to build muscles, Vegetables and fruits and dairy are starchy foods, the parent's education to select kind of food and the impact of activities due to take meal, about watching TV or videos mother education level and father education level are same no differences that is mean education level of parents not effects of watching TV or videos. But for exercise or participate in sports activities the education level of mother no differences in other hand there is big different in father education level about this matter. For using mobile in a social media or to watch games or videos there is highly significance different in parent's education level.

Recommendations:-

1-Awareness on Health Education at Primary and secondary Schools

2-Health education should be made a part of the school curriculum.

3-Regular workshops and seminars from health specialists/experts would have a great impact in reducing the consumption of junk food to great extent.

4-Establishing early awareness educational programmes aimed at children between the ages of 2– 18 will educate about the adverse medical effects and complications associated with fast food induced obesity

5-promote active physical activity that is supported by the government for a longer duration.

6-It is likely that the most sustainable strategy would be to implement policy interventions such as regulations that restrict what foods can be sold in

schools coupled with strategic nutritional education programs at the school level.

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