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Research Article

Body Mass Index (BMI) Standard measure for healthy Family living.

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Abstract

This project work is focused on body mass index as standard measure for healthy family living, a case study of Tafa local government area of Niger State. BMI was used to find the health status of the research population. The instruments used for measuring the subject biometric parameter were metre rule for height, compression balance for the weight, observation and face to face oral interview were used by the researcher for data collection. The analysis of data was done using percentage and average calculations. The result within 20 – 30 years, 30 – 40 years, 40 – 50 years, 50- 60 years respectively with male respondent having 22.57 kg/m^2, 23.06 kg/m^2, 30.52 kg/m^2, 31.83 kg/m^2, and female respondent 26.52 kg/m^2, 30.9 kg/m^2, 27.7 kg/m^2, 31.97 kg/m^2, respectively. There was an indication of overweight and underweight and less of normal weight range in which underweight and overweight was discovered to be one of the factor responsible for the high rate of mortality and morbidity and maybe why the health standard of the families were low. It was recommended that government at all level should organise awareness program on BMI categorization and the need to maintain a normal BMI range in order to enhance healthy living among family member's, which will in return reduce the high rate of mortality and morbidity in the society and to provide adequate steps and procedure through which causes of underweight and overweight/obesity can be reduced or minimized.

Keywords: BMI, health, Standared, family living.

Introduction

For centuries now, human survival has depend on body fat accumulation and the maximizing energy utilization, but in modern times, when the supply of energy is constant throughout the year and the energy demanded for daily activities has decreased , adaptation has become severe or handicapped. Body Mass Index (BMI) has become the measurement of choice by many health professionals to measure underweight, normal weight, overweight/obesity in children and adult and their deleterious effect on the health of individual .Body Mass Index as a unit of measurement, use to assess how much an individual person's body weight, depart from what is considered normal or desirable for a particular health.

Body Mass Index was originally called Quetelet index after a Belgian astronomer, mathematician, statistician

and sociologist Adolphe Quetelet in the year 1830─1850 during the early 19th century at the course of doing what he called ʹsocial physicsʹ, which was specially based on the seven centuries study and his purpose was to obtain a relationship to describe the standard proportion of the human body using the ratio of mass and height in an average adult. Throughout his research he discovered that mass varied not in direct proportion with height but rather more closely to the square of the height.

The name Quetelet index was changed to Body Mass Index (BMI) as the ratio of weight to square of height, this was owned to the popularity of a paper published in July 1972 edition of the journal of chronic disease by Ancel Keys, it was in this edition that Body Mass

Index was found to be the best proxy for body fat percentage among rations of height and weight. The interest and need to measure body fat came with an increase of obesity in prosperous western societies.Every individual need certain amount of body fat for stored energy, heat insulation, shock absorption, and other body function. However, an under or excess deposition of this fat is dangerous to the health of family members.

Body Mass Index is used by many health professionals as an indicator of standard of living, according to Nube' et al (2005), he found out that the direct relationship between body mass index and the characteristics households analysed makes it possible to expect the difference in standard of living which may be reflected on body mass. Although weight is also positively related to the other indicator of standard of living, height is not considered appropriate proxy due to genetically condition, but because of Body Mass Index (BMI) include the both (that is weight and height) that is why it is used as a better approach to measure standard of living .

Steckel (2003) and Flegal et al (2003), in their finding associates standard of living with statures of the people (because stature is an appropriate indicator of health status indirectly) can reflect not only genetics but also environmental condition and it can give information about history of net nutrition and their respective studies confirm that. Other research made by authors like Jeffery and French (2008), Fernald (2007), Garrow and Summerbell (2004) have also discover positive relationship between Body Mass Index as standard of measure.

Body Mass Index have been used by many health researchers to find out that when the living standard of families are under or above the set standard in terms of body weight, there tend to be a high risk of developing cancer, diabetes, respiratory diseases, infertility, digestive problem and an impaired immune problems among several other infections which is causing high rate of death in the society. While a normal weight provide less risk of developing such diseases and infection as mention in Eckel et al (2007) more so, morbidity and mortality rate tend to raise with an increase or decrease in body weight and that is why Emmanuel and oguche (2003) in their works concluded that Body Mass Index (BMI) is of public health importance especially to the society. Body Mass Index can be said to be a statistical measure of the weight of a person, scaled in accordance to the height in square, used by many to estimate if a person is below or above the set standard which is considered optimal/normal in the body mass index category table, it is also widely and commonly used to correlate health problem with weight in a population because it is cheap and easy to use statistic and calculation.It is the desire of every family member to live a health life and also to reproduce offspring of their kind, but they tend to pay little or no attention to some crucial aspect of health which is very important, as it has a negative effect not only on the present generation but also on the next generation, if not properly handled and that is why this research work was formulated to investigate the factors such as social, economic, and environmental factors and their effect on the body mass/weight especially on the healthy standard of family living.

Body Mass Index comprises of many deficiency especially when the body mass is below or above the normal weight standard and that is why this research is aimed to enlighten people on the effect of body mass index category and ways of maintaining the normal weight standard of living, which is considered healthy to the health of an individual.

This is also to know the role of body mass index especially on different age bracket; especially ages from 20-60years (since they are the independent/working population of a nation) and it impact on the standard of living of each family member.

Research questions

The following questions were posed as a guild for the successful implementation of the research;

i. What is the prevailing body mass index status of each age group and sex?
ii. What are the causes of the varying body mass category among families?
iii. Does dietary pattern contributes to the body mass status of a family?

Study Area

Niger State in Nigeria has twenty five (25) Local Government Areas which include: Rijau, Kontagora, Agwara, Suleja, Chanchaga, Munya, Makwa, Katcha, Agaie, Lapia, Paikoro, Gbako, Lavun, Edati, Mashegu, Borgu, Bida, Bosso, Rafi, Bida, Gurara, Shiroro, Mariga, Magama and Tafa.

This study adequately covers families in Tafa Local Government Area of Niger State, which is adjoining the Federal Capital Territory, its headquarters is Wuse, which is located at 9° 15'N, 7°15'E/9.250°N,7.250°E, with the total land area of 226.5km^2 and density/square kilometres of 369, with a population of 83,544 as at 2006 national census and it is constituted of eleven wards which are Dogon Kurmi, New Bwari, Zuma West, Zuma East, Wuse West, Wuse East, Iku, IjaGbagyi, IjaKoro, Gauraka and Garam.

The study covers the ages between 20-60 years with each group having twenty (20) individuals, excluding pregnant women, sick family members and children under the ages of 0-19 years.

Fig 1 Map of Niger State
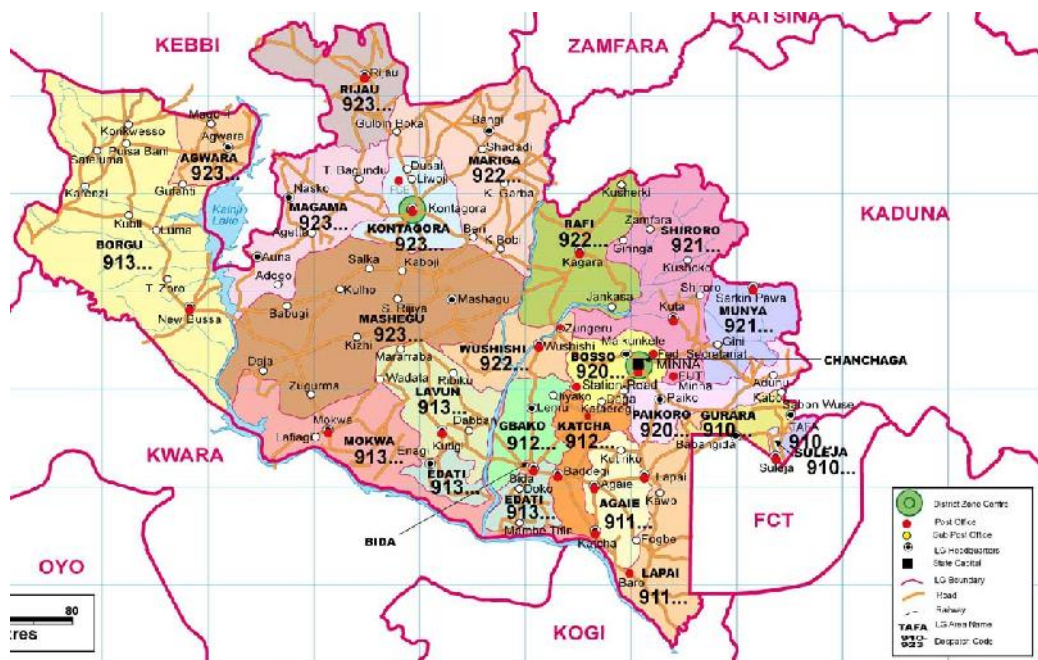
Research methodology and data presentation.

The sample, instrument, research designs, data collection plan for data analysis, frequency and percentage was used for the analysis of data which was gotten from the eighty (80) questionnaire of which twenty (20) copies was given to each age bracket of the research population and the statistical procedure was chosen based on descriptive research work.

The sample

The sample is composed of one ward which was randomly selected among the eleven wards in Tafa Local Government Area of Niger State, which is Garam ward.

Sample population

The questionnaires were administered to families residing in Garam ward of Tafa Local Government Area of age bracket 20-60 years old, with the exclusion of pregnant women, ill health, and children under the ages of 0-19 years.

The design

Questionnaires were designed by the researcher and use in the study. The questionnaires were interpreted to the illiterate people and responses were recorded by the researcher appropriately.

The instrument

Relevant literatures on Body Mass Index as standard measure for family living were reviewed. The questionnaire was designed on the basis of day to day dietary food intake and the physical activity, opinions of the family members were asked in the questionnaire.

Data collection

The questionnaires designed was hand delivered to family members by the researcher and assistant researcher, the questionnaires were collected back on the spot while others were returned to the researcher after some days by the assistant researcher.

The illiterate people were interview and the responses were recorded by the researcher, the researcher visited various family members used as research sample population were used for interview using the questionnaires designed and observation by measuring them with the aid of a ruler in metre and weight with home weight measure.

Data analysis

The information obtained from the questionnaire will be used to formulate the findings for the study, from the questionnaire responses, total number of each respondent from each age group based on sex were obtained and express in their frequency, average and percentage was formed to find out body mass index as standard measure for family living, a case study of Tafa Local Government Area of Niger State.

The below formulas were used by the researcher to analyse the data obtained from the questionnaires responses.

$$\text{Percentage} = \frac{\text{Number of responses} \times 100}{\text{Total no of respondent}} \quad 1$$

$$\text{Average weight} = \frac{\text{Total Number of weight taken}}{\text{Number of respondent in the group}}$$

$$\text{Average Height} = \frac{\text{Total number of height taken in group}}{\text{Number of respondent in the group}}$$

$$\text{Body Mass Index Average} = \frac{\text{Total number of BMI calculated}}{\text{Number of respondent been calculated}}$$

$$\text{Body Mass Index Prime Average} = \frac{\text{Total number of BMI prime calculated.}}{\text{Number of respondent been calculated.}}$$

Results

Table 1 Distribution of respondent based on their daily physical activity level

Activity Level	Number of Respondent	Percentage (%)
Active	20	25%
Sedimentary	60	75%
Total respondent	80	100

From the data above, it was observed that twenty (20) respondents were engaged in active activities daily which resulted to 25% of the total research population, while 60 respondent were engaged in sedimentary activity daily which have the highest population of 75% of the total respondent.

Table 2. Distribution of respondent based on their marital status.

Marital Status	Frequency	Percentage	BMI Average
Married	50	62.5%	30.88
Divorced	3	3.75%	29.92
Singles	22	27.5%	27.69
Others (widows and widowers)	5	6.25%	31.40
Total	80	100	

From the data above, it was observed that twenty (50) respondents were married in active activities daily which resulted to 25% of the total research population, while 3 divorced and 22 respondent were single with married having the highest population of 62.5% of the total respondent.

Table 3 Distribution of respondent based on the dietary/ food nutrient intake consumption.

Foods Classes	Frequently	Fairly Frequent	Not Frequent	%
Carbohydrate	25	20	10	27
Proteins	10	15	13	14
Vitamins	7	9	12	10
Mineral salt	5	7	9	10
Fat and oil	30	20	15	31

From the table above, 31% of food nutrients consumed by individual is fat and oil based foods,27% was carbohydrate based foods, 18% was protein based foods, 14% was for vitamins foods, and 10% was for mineral salt foods.Out of the foods classes taken by respondent 45 people consume carbohydrate frequently and fairly frequent, while 10 not frequents respectively.25 feeds on protein frequently and fairly frequent and 13 are not frequent protein consumers, 16 feeds on vitamin food nutrients frequently and fairly frequents while 12 are not frequent consumers, 12 consume minerals salt foods while 9 consume but not frequents and 50 consumes fat and oil foods frequently and fairly frequents and 15 respondent feeds on fat and oil but not frequents.

Table 4 Showing category of **MALE** respondent from age 20-30 with their respective height, weight, BMI and BMI prime.

S/N	Year	Height (M)	Weight (KG)	BMI PIME =BMI/25	BMI	Category
1	20-30	1.69	69	0.97	24.13	Normal weight
2	20-30	1.69	70	0.98	24.48	Normal weight
3	20-30	1.72	72	0.97	24.32	Normal weight
4	20-30	2.00	77	0.77	19.25	Normal weight
5	20-30	1.53	40	0.68	17.09	Underweight
6	20-30	1.75	75	0.98	24.51	Normal weight
7	20-30	1.65	66	0.97	24.24	Normal weight
Total average		±1.72	±67	±0.90	±22.57	Normal weight

From the above table, it was observed that the average height of male respondent under the ages of 20-30 is 1.72metre, average weight of 67kg and average BMI prime of 0.90, and BMI 22.57kg/m^2, which is normal weight according to the profile category.

Table 5 Show the distribution of **FEMALE** respondent of age 20-30, with their respective height, weight, BMI prime and BMI.

S/N	Year	Height (m)	Weight (kg)	BMI prime BMI/25	BMI	Category
1	20-30	1.60	65	1.02	25.39	Overweight
2	20-30	1.25	60	1.54	38.46	Obesity class 2
3	20-30	1.56	45	0.74	18.52	Normal weight
4	20-30	1.81	61	0.74	18.60	Normal weight
5	20-30	1.41	65	1.31	32.66	Obesity class 1
6	20-30	2.13	75	0.66	16.52	Underweight
7	20-30	1.89	95	1.06	26.61	Over weight
8	20-30	1.97	56	0.58	14.43	Under weight
9	20-30	1.49	56	1.01	25.23	Over weight
10	20-30	1.58	99	1.58	39.6	Obesity class 2
11	20-30	1.44	70	1.35	33.82	Obesity class 1
12	20-30	1.61	71	1.10	27.39	Overweight
13	20-30	1.64	74	1.10	27.51	Overweight
Average Total		±1.64	±68.62	±1.06	±26.52	Overweight

From the table above, it was noticed that the average height of female respondent under the age of 20-30 is 1.64m, weight 68.62kg, BMI of 26.52kg/m^2 which indicate most been overweight, and BMI Prime of 1.06.

Table 6 Showing the distribution of **MALE** respondent of age between 30-40, with their respective weight, height, BMI and BMI Prime.

S/N	YEAR	Height (M)	Weight (kg)	BMI Prime	BMI	Category
1	30-40	1.70	66	0.91	22.84	Normal Weight
2	30-40	1.70	70	0.97	24.22	Normal Weight
3	30-40	1.75	100	1.31	32.68	Obesity Class 1
4	30-40	2.12	58	0.52	32.68	Overweight
5	30-40	1.65	75	1.10	12.92	Over Weight
6	30-40	1.81	69	0.84	27.57	Normal Weight
7	30-40	1.98	77	0.79	21.04	Normal Weight
8	30-40	1.70	68	0.94	219.643.53	Normal Weight
Average Total		±1.80	±72.88	±0.92	±23.06	Normal Weight

From the table above, it was examined that male respondent of age 30-40 years has an average of 1.80m, weight 72.88kg, BMI of 23.06 kg/m^2 and a BMI prime of 0.92, which indicate normal weight.

Table 7 Showing the distribution of **FEMALE** respondent of age 30-40 years, with their respective height, weight, BMI, and BMI Prime.

S/N	Year	Height (M)	Weight (kg)	BMI Prime	BMI	Category
1	30-40	1.55	85	1.42	35.42	Obesity Class 2
2	30-40	1.45	56	1.07	26.67	Overweight
3	30-40	2.14	70	0.61	15.28	Under Weight
4	30-40	1.60	98	1.53	38.28	Obesity Class 2
5	30-40	1.54	75	1.27	31.65	Normal Weight
6	30-40	1.92	88	0.95	23.85	Normal Weight
7	30-40	1.66	89	1.29	32.25	Obesity Class 1
8	30-40	1.67	94	1.35	33.69	Obesity Class 1
9	30-40	1.39	89	1.84	46.11	Morbid Obesity
10	30-40	1.86	79	1.15	28.12	Over Weight
11	30-40	1.61	92	1.42	35.49	Obesity Class 2
12	30-40	1.65	64	0.95	23.80	Normal Weight
Total Average		±1.61	±81.58	±1.21	±30.9	Obesity Class 1

From the table above, it was observe that the average of female respondent between the ages of 30—40 are: height 1.61m, weight 81.58kg, BMI of 30.9kg/m^2 and a BMI Prime of 1.21, which is an indication of obesity class.

Table 8 Showing distribution of **MALE** respondent of age 40-50 years: with their respective weight, height, BMI, and BMI Prime.

S/N	Year	Height (M)	Weight (kg)	BMI Prime	BMI	Category
1	40-50	1.65	80	1.18	29.41	Overweight
2	40-50	1.66	80	1.16	28.99	Overweight
3	40-50	1.65	58	0.85	21.32	Normal Weight
4	40-50	1.80	85	1.05	26.23	Overweight
5	40-50	1.67	90	1.29	32.26	Obesity
6	40-50	1.60	68.5	1.07	26.76	Over Weight
7	40-50	1.69	60	0.84	20.98	Normal Weight
8	40-50	1.22	100	2.68	67.11	Obesity Class 2
9	40-50	1.64	73	1.09	27.14	Overweight
10	40-50	1.63	78	1.17	29.32	Overweight
11	40-50	1.80	85	1.05	26.23	Overweight
Total Average		±1.64	±77.95	±1.22	±30.52	Obesity Class 1

From the data analysed above, it was discovered that the average of male respondent under the ages of 40-50 years are: height 1.64m, weight 77.95kg, BMI 30.52kg/m^2 and BMI Prime 1.22, which indicate obesity class 1.

Table 9 Showing the distribution of **FEMALE** respondent of age 40-50 years, with their respective weight, height, BMI and BMI Prime

S/N	Years	Height (M)	Weight kg)	BMI Prime	BMI	Category
1	40-50	1.62	65.5	1.00	25.00	0ver weight
2	40-50	1.60	70.00	1.09	27.34	Over weight
3	40-50	1.66	75	1.09	27.17	Over weight
4	40-50	1.65	70.1	1.03	25.77	Over weight
5	40-50	1.50	60	1.07	26.67	Over weight
6	40-50	1.60	70	1.09	27.34	Over weigh
7	40-50	1.81	95	1.16	28.96	Over weight
8	40-50	2.00	100		25.00	Over weight
9	40-50	1.65	85	1.25	31.25	Obesity class 1
Total Average		±1.68	±76.73	± 1.09	±27.7	Over weight

From the table above, it was discovered that the male respondent average height was 1.68m, weight 76.73kg, BMI 27.7KG/M^2 and BMI Prime of 1.09, which indicate that most of them are overweight.

Table 10 Showing respondent of **MALE** respondent between the ages of 50-60 years: with their respective height, weight, BMI and BMI Prime.

S/N	Year	Height (M)	Weight (Kg)	BMI Prime	BMI	Category
1	50-60	1.65	64	0.94	23.50	Normal weight
2	50-60	1.80	93	1.15	28.70	Over weight
3	50-60	1.45	98	1.87	46.67	Morbid obesity
4	50-60	1.67	70	1.60	25.10	Over weight
5	50-60	1.63	93	1.39	34.73	Obesity class 1
6	50-60	1.67	89	1.32	32.91	Obesity class 1
7	50-60	1.67	87	1.25	31.20	Obesity class 1
Total Average		±1.65	±84.86	± 1.36	±31.83	Obesity class 1

From the table above it was observed that the average male respondent of 50-60 years has a height 1.65m, weight 84.86kg, BMI 31.83KG/M^2 and BMI Prime 1.36, which shows that they are mostly having obesity class 1.

Table 11 Show the distribution of **FEMALE** respondent between the ages of 50-60 years, with their respective weight, height, BMI and BMI Prime.

S/N	Years	Height (M)	Weight (Kg)	BMI Prime	BMI	Category
1	50-60	1.65	88	1.29	32.35	Obesity class 1
2	50-60	1.64	92	1.37	34.21	Obesity class 1
3	50-60	1.63	87	1.31	32.71	Obesity class 1
4	50-60	1.63	96	1.44	36.09	Obesity class 2
5	50-60	1.64	82	1.21	30.31	Obesity class 1
6	50-60	1.65	80	1.18	29.38	Over weight
7	50-60	1.70	71	0.98	24.57	Normal weight
8	50-60	1.67	89	1.32	32.91	Obesity class 1
9	50-60	1.67	96	1.36	34.01	0besity class 1
10	50-60	1.59	91	1.44	35.99	Obesity class 2
11	50-60	1.50	68	1.21	30.22	Obesity class 1
12	50-60	1.95	80	0.84	21.05	Normal weight
13	50-60	1.46	89	1.67	41.78	Morbid obesity
Total Average		±1.64	±85.31	±1.28	±31.97	Obesity c lass 1

From the table above, it was shown that an average female respondent of age 50-60 years of the study population has height of 1.64m, weight 85.31, BMI 31.97KG/M^2 and BMI Prime of 1.28, which indicate obesity class 1.

Discussion

From table 1 of data presentation and analysis, it was observed that the physical activity level of respondent was low with 20 respondent having 25%, and sedimentary activity having the highest with 60 number of respondent having the total of 75% out of 100%, and that is why majority of respondent are having body mass index ranging from overweight - obesity class and less are having body mass index category of underweight - normal weight which agrees with Martinez- Gonzales et. al, (2009) experiment in which he examined physical activity, sedimentary lifestyle and overweight/obesity in a group of 15 member's countries of European Union and found a strong association between overweight/obesity and a higher body weight with a sedimentary lifestyle that is lack of physical activity in adult population. Similarly Hernandez et. al, (2009), investigated the relationship between obesity and physical activity, television programs and other forms of video viewing among 712 children within the ages of 9-16, in Mexico and reported that prevalence of obesity was related to physical inactivity and television viewing.

Table 2, shows the marital status of the respondent ranging from the ages of 20-60 years old shows that 50 of the respondent both male and female are married, 3 are divorced, 22 are single, and 5 are widows and widowers. With a body mass index of 31.88 kg/m^2, 29.92 kg/m^2, 27.69 kg/m^2, and 30.40 kg/m^2 respectively which ranges from overweight to obesity, this meant be as a result of the comfort and peaceful mind that one derived from the marriage and most especially the females who have ever given birth to and that is why women who have given birth before gain weight more than those who have not given birth because most barren family are still restless full with emotional disturbance and that is why most of the married still expecting children weight under/normal weight unlike the ones with children.

Most of the single in the respondent weight normal weight and underweight this may be due to their physical activeness, less stress or emotional disturbance from marriage problems and other factors, with a balanced meal that have made them to have such average body mass index. And the divorced and widows weight normal and underweight respectively this may be because of restlessness and stress of learning to take care of children single handed and also emotional tremors and illness if they have been affected by the infections that killed the ex- partner(if he suffered from a life termination infection or diseases).

Table 3 shows the distribution of respondent based on their nutrient intake and food consumption most of the respondent consume energy dense food most especially fat foods, carbohydrates food have 27%, protein 18%, fat and oil 31%, mineral salt 10%, vitamin 14%, and less of fresh food but more of dried and preserve foods and less of activity work make the fat to be build up in the body leading to overweight and obesity. Intake of excess dietary fat has been implicated as a major cause of obesity for decades, Lissner and Heartman (2005) says that fat provide more energy than protein and carbohydrate foods per unit weight and contributes to overweight/obesity. It can also influence food intake, energy metabolism and substrate oxidation.

From the data obtain in table 5-12 of age and sex classification 20-60 years it was observed that both the male and female respondent's body mass index increases progressively with their age which ranges from age (20-60) with male having 22.5 kg/m^2, 23.06 kg/m^2, 30.52 kg/m^2, 31.83 kg/m^2 and female 26.52 kg/m^2, 27.7 kg/m^2, 30.90 kg/m^2, and 31.97 kg/m^2 respectively and the body mass index of female differ because the female/women weight higher than the male because of the heredity advantage of women having more body fat than male, which is usually distributed on their body structure different, according to Beller (2007), " new born girls weight less at birth than new born boys but have a higher percentage of fat " and that is why Basley (2011), said " the trend continues as the child matures, with female having an average of two times the fat of men as they tend to grow with age" and that is what the research data have shown that women tend to have higher fat than men as their various age increases.

From age 30-60, their body mass index ranges from overweight to obesity class 1, this may be because majority of the female respondent in this age category are married and with children, because it is believed that pregnancy add to the increase in female weight and also that family planning drugs used by most married or single female especially the pills or injection add to the weight gain of most women. And most especially because they engage in sedimentary

activity because the strength of youthfulness have greatly reduce as they get older and because of these the excess fat that tend to be burnt from the stored fat, most especially because they engage in sedimentary activity because the strength of youthfulness have greatly reduce as they get older and because of these the excess fat that tend to be burnt from the stored fat through excises are not burnt thereby, leading to weight gain (overweight and obesity).

Conclusion

In this , the researcher has shown vividly through data interpretation that underweight and overweight/obesity are of public health importance especially among families in Tafa Local Government Area of the research study, especially underweight which is mostly unnoticed but have health effect and as such is of health importance, hence these are the reasons behind dangerous disease that have resulted to high mortality and morbidity rate in the society.

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