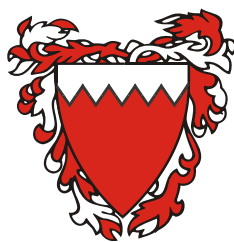


**Kingdom of Bahrain
Ministry of Health**

**NATIONAL NUTRITION SURVEY
FOR ADULT BAHRAINIS
AGED 19 YEARS AND ABOVE**

Nutrition Section
2002



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II. ABSTRACT

This study was conducted at the national level to establish a baseline information on the nutritional status of adult Bahraini population by attempting to identify their dietary habits, define the prevalence of obesity, any diet related chronic diseases and possible association with lifestyle and socio-economic factors. A total number of 2301 person (1118 males and 1183 females) participated in this survey. The target population was adult Bahrainis 19 years of age and over. Data collection included anthropometric measurements, 24 hrs dietary recall and food frequency questionnaire. Lifestyle, eating habits, self-reported health conditions and socio-economic data were collected using a general questionnaire. Hemoglobin levels were determined using finger prick technique. The WHO- BMI standards were adopted to define obesity.

The dietary data were computerized using Dankost 2000 database (Danish/WHO diet analysis software package based on Middle East foods) and the data were analyzed using Epi Info Software. Results showed high prevalence of overweight (36.7% males and 28.3% females) and obesity (23.3% males and 34.1% females). The consumption of protein, fat and carbohydrates were found to be high. The intake of calcium was around 80% for males and 70% for females of the reference nutrient intakes for the United Kingdom adult population. While the intake of sodium was 300% of the recommended levels, the potassium intake did not exceed 55%. Results also showed that 21% and 37% of males and females, respectively, suffer from anemia, which might be attributed to the deficiency of iron, folic acid, and unhealthy dietary habits, as well as hereditary anemia.

III. INTRODUCTION

The state of Bahrain, similar to the other Arabian Gulf Countries have been witnessing a rapid economic growth during the past 35 years. This was mainly a result of increased oil revenue. This economic growth which greatly enhanced the health services lead to the control of the infectious diseases and improvements in public health conditions. The economic reform has also resulted in widespread food adequacy and increased per capital income ^{1,2}. Concurrently, the dietary pattern in Bahrain has been moving steadily toward consumption of larger quantities of animal products and a higher fat intake ³, which are typical of the "affluent" diet in the industrialized countries. This change in dietary pattern, along with a rising life expectancy and increasing urbanization^{3,4}, may have contributed to the emergence of diet related chronic diseases such as obesity, coronary heart disease, diabetes and cancer in Bahrain. According to Bahrain Health Information Directorate report⁵, 77.6 of the death rate per 100,000 population in Bahrain are due to cardiovascular diseases, 20.3 are due to endocrine, nutritional and metabolic disorders (diabetes) and 35.8 are due to cancer diseases.

The economic development also lead to major changes in the daily physical activities of the population. The growth and spread of private transport and occupational changes had a major impact on the lifestyle. Noticeable shift from heavy and medium intensity works toward light work (mainly office or desk works) took place among the majority of the work force since the

beginning of the seventies. The spread of television & video.... etc, have changed the spending leisure time into more sedentary type. All these changes in the lifestyle of the population resulted in reducing their daily physical activities.

It is well known that food- related behavior is complex and determined by the interplay of many factors, including physiological factor, sociodemographic factors such as income, education and occupation, behavioral and life style factors such as physical activity, smoking, knowledge and attitudes related to diet and health ^{6,7}.

In a study published by Al-Mannai et. el. ⁸, on prevalence of obesity among Bahraini adults aged 20-65 years, they found that the overweight and obesity prevalence rates, using the Body Mass Index (BMI) as a criterion, were 26% and 16% in males, and 29% and 31% in females, respectively.

Moosa and Zein ⁹ studied the prevalence of anemia, mainly among pregnant women in Bahrain screened by serum ferritin, reported that 40% of the women had iron deficiency anemia or were at risk. While the prevalence of iron deficiency anemia according to a study conducted by Blair and Gregory during 1985 ¹⁰ among school girls aged 6-18 years, showed that 24% of school girls were anemic.

It is generally agreed that good nutrition and healthy eating habits are considered the key factors in promoting good health and preventing diet-

related diseases.

Description of the dietary intake data reflects the degree to which physiologic needs for nutrients are being met. In addition, this description can detect nutritional deficiencies in the early stages even before a more severe condition appears, besides an increase in the effectiveness of nutritional support, education, and counseling.

On the other-hand knowledge of food consumption and nutrient intake trends is essential to health and nutrition policy makers, to food producers, and health officials who should develop necessary programs that meet consumer needs^{6,7}. Such information is also vital for assessment of the extent to which the population meets national nutrition recommendations, and could also be of great benefit in setting health programs toward combating the chronic diseases and improving quality of life, and specific information provided will allow designing interventional strategies to target sub- groups of the population⁶.

In response to the above mentioned changes of socio-economic and health conditions, and due to the lack of up-dated comprehensive data on diet- related changes, this survey was conducted at the national level to assess the dietary intake and related health indices, which will provide valuable data needed to establish base-line information that could give an overall picture of the nutritional status of this age cohort in the Kingdom of Bahrain and which could assist in developing health strategies at the national level.

IV. OBJECTIVES OF THE SURVEY

The objectives of this survey are to:

1. Establish baseline information on nutritional status of adult Bahraini population, and to detect any possible nutritional deficiencies or concerns.
2. Identify the national pattern of dietary intake.
3. Define the magnitude of the prevalence of overweight, obesity, diet related chronic diseases and anemia.
4. Identify the possible association of lifestyle (smoking, physical activity) and socioeconomic factors with the prevailed dietary habits.
5. Provide a direct basis for making decisions about nutrition education and program delivery priorities.
6. Identify opportunities for improving the nutritional status in Bahrain.

V. SURVEY METHODOLOGY

A. Survey Design

Bahrain, being a small country and due to the rapid and even distribution of the economic growth among the population, could be classified as city state, where no major differences are observed between its various parts. However, administratively it is divided into 12 regions. These regions are Manama City (capital), Muharraq, Hidd, Jidhafs, Sitra, Isa Town, Riffa, Hamad Town, Northern, Western, Eastern and Central areas.

As per the suggestion of Central Statistics Organization in Bahrain the same area classification was adopted for this survey. Table 1 shows the demographic

characters of the samples selected from all regions in Bahrain. The targeted population for this survey were adult Bahrainis aged 19 years and over , excluding those who live in nursing homes and institutions who represent a small number any way. The purpose of focusing on this age group is due to the fact that they fall in greatest risk age-wise and being greatly exposed to diet related diseases.

The total number of the sample was 2301 persons, composed of 1120 males and 1181 females. The age group of this study sample (19+ years), represents 46% of total Bahraini population. The samples were further subdivided age-wise into 6 smaller groups. The subdivision made as following; 19-29, 30-39, 40-49, 50-59, 60-69 and 70+, for both males and females. The total response rate of the survey was very high as it reached 95.9%. However, of the 2301 persons, 287 (12.5%) subjects were unable to participate in blood test for hemoglobin level.

B. Data Collections

Survey team composed of 4 nutritionist, 12 health professionals (nurses and health educators), and 8 social workers.

The survey staff was subjected to two weeks of training. The training program focused on taking body measurements (height and weight), interviewing techniques and information gathering from the subjects. The staff were divided into ten teams, each consist of two surveyors, including at least one health worker. All teams worked in parallel during the same time span, which was from 1998 through 1999; under the supervision of the nutritionists.

Information on health, diet, and lifestyle were compiled with the aid of a questionnaire, which was administered in local language (Arabic) in order to be culturally appropriate as in other studies¹¹. A sample questionnaire is presented in appendix 1.

C. Survey Data

1. Anthropometric Data

Standard techniques were adopted for obtaining anthropometric measurements. Weight was measured with light clothing but without shoes to the nearest 0.1 Kg. using a portable weight scale (from Soehnle Company). Height was measured using a portable height scale (from Seca Company). The subjects were instructed to stand bare feet with their head in an upright position. The reading was noted to the nearest 0.1 cm. From the ratio of weight to height square, the Body Mass Index (BMI) was determined where $BMI = \text{Weight (kg)} / \text{Height}^2(\text{m})$. Each of these measurements was taken by one trained surveyor and was double-checked by another. The scales were checked for accuracy before starting the survey and after and then rechecked periodically.

2. Socio-Economic and Life Style Data

The demographic data such as age, sex, education, occupation, and financial income (household total income per month) were compiled. Information on physical activity, smoking, dietary habits, and self-reported health problems were also obtained from the same questionnaire.

3. Dietary Data

Respondents were asked to report all foods and beverages consumed over the previous 24 hour time period (midnight to midnight). For accuracy, respondents were first asked to recall all food items in an uninterrupted manner, then specific probes for the types of foods, preparation ingredients, and the amount were verified for the food items mentioned. Portion sizes were estimated using bowls and plates

regularly used among Bahraini households, and information on food consumed away from home were also collected through direct questions and recorded in portion sizes^{12,13,14,15}. Supervisors from the nutrition section converted the portion sizes into grams before the data entry.

Faber et al (2001) found that the use of a single 24-hour dietary recall could easily fail to spot the consumption of certain food items, which might be important. Consequently, an unquantified food frequency questionnaire (FFQ) was developed to assess the usual dietary intake over a week period to minimize the effect of day-to-day variation in dietary intake^{16,17}. Because of the nature of standard FFQ, some individual foods were already grouped together and thus could not be distinguished from one another. For example: apple, orange, and pears are the first items listed on the FFQ, and for the purpose of analysis, all three items were considered as type of one food, "fruit group". Dietary consumption was then calculated as percentage of different food groups intake. Frequency of the diet intake was classified as never, 1 time, 2-4 times, 5-7 times a week, for all age group (Appendix 1: Questionnaire)¹⁸.

4. Hemoglobin Estimation

Hemoglobin level measurements were determined using finger prick technique and blood analysis was conducted through Hemocue machine. The measurements were taken by the survey teams nurses. The following WHO Criteria for anemia cases according to hemoglobin levels for adult females (non-pregnant) and males was adopted¹⁹:

For adult males Hb<13 g/dl For adult females Hb<12 g/dl

D. Data Analysis

The WHO-BMI standards^{20,21} were adopted to define the obesity. The classification

is as follows: underweight defined as a body mass index less than 18.5; normal weight as BMI between 18.5 and 24.9; overweight between 25 and 29.9; obese between 30 and 39.9; and morbid obese as a body mass index equal or greater than 40. The percentage of the study population in different weight categories were calculated for the total sample and stratified by sex, age group and region. In addition, the significance of changes in the proportion of individuals classified as underweight, normal weight, overweight, obese, or morbid obese were studied in correlation with other lifestyle patterns such as diet, physical activity and some of the sociodemographic characteristics.

The completed dietary 24-hour recalls were verified by the interview as they were received, and questionable or incomplete entries checked and completed. After verification and correction of the forms, the dietary data were computerized using the Dankost 2000 database (Danish/WHO- Diet analysis software package based on Middle East foods), with the cooperation and supervision of data entry and analysis by WHO consultant. Energy, micro and macronutrient intakes were compared to estimated average requirements (EARs) for energy and nutrients for UK, as per to the age and sex of the respondents²².

For the Food Frequency Questionnaire (FFQ) all the initial food groups covered in the questionnaire, as well as several combinations of food groups were tested. On the basis of trends noted in dietary pattern, those food group combinations were considered. For example, when variety in more than one food group was noticed, the food groups were combined and the variety score was computed from the new, larger food group, (e.g. fish, chicken, meat, meat products groups; all combined into one larger food group, meat/poultry/fish/eggs-group)¹⁸.

Data was processed using the Epi Info and Excel programs. Means, standard deviations, and correlations with different relevant factors were determined.

VI. RESULTS

A. Demographic Characteristics of the Sample

The sample distribution by gender, age, education level, occupation, marital status, household income, and family size are presented in Table 1 and figures 1 to 5. A total of 2301 subjects of both sexes were randomly selected from all regions in the country.

The sample, for both sexes, was sub grouped age-wise in a regular increment of 10 years for the purpose of having detailed information on inter-relation of the studied parameters (Fig. 1).

The geographical selection was based on the same population proportion of distribution in Bahrain (Fig. 2). Education levels were classified as illiterate and having education either less or more than high school (Fig. 3).

Occupation status was classified as employed, unemployed, student, and retired. Due to the nature of this survey, since the fieldwork was carried mostly during morning time and covered the non-working females, therefore, house duties has been defined as a type of occupation (Fig.4). The household monthly income for 58% of the sample ranged between 150 to 350 Bahraini Dinars (1 Dinar = 2.6 US Dollar) (Table 1). The average family size in Bahrain is around 6 persons ²³, therefore, as a cut off point the same criteria was used. The marital status of the sample is shown in (Fig. 5).

B. Health Related Indices, Smoking and Physical Activity Behavior of the Sample

Table 2 reports the prevalence of smoking habit among males and females. 29.5% of the male subjects reported to be regular smokers compared to 18.6% of the females. Table 3 shows that, the percentage of male smokers are almost the same among all male age groups. However, the percentage among the female was less by 7% up to age of 39 years, and it increased there after.

When analyzed, the educational levels of the smokers, almost 88% of the male smokers where either illiterate or received less than high school education compared to 99.5% in the females. As for type of smoking 72.1% of the males reported to smoke cigarettes and 96% of the female reported to smoke shisha.

As for the type of activities involved in occupation, data in Table 2 shows that 82.4% of males and 98% of females occupation is classified as sedentary and standing type (e.g. office work, teaching, nursing, ...etc.). However, only 17.6% of males and 2% of females occupation activities was classified as light and heavy manual (e.g. carpentering, working in construction, plumbing, ... etc).

Table 2 also shows that 80.1% of males and 83.3% of females respondents reported that they were practicing physical activities during leisure time, and the type of physical activities practiced were reported to be between moderate & heavy i.e., 67.1% and 10.4% for males and 73.5% and 2.2% for females, respectively (Table 4).

For the purpose of reflecting the real health status of the group. The participants were asked to report any cases of clinically diagnosed chronic diseases such as cardiovascular, diabetes, hypertension, high cholesterol level, and cancer. Those

who reported to suffer from any of the above diseases were not excluded from the survey. Table 2 shows the result of self-reported chronic diseases for both sexes. Results show the mean (of both sexes), in descending order of magnitude of the reported diseases are as follows; 16.4% Hypertension, 14.5% Diabetes, 4.2% Heart Attack, 2.9% hypercholestermia, 0.7% Cancer and 0.4% stroke.

C. Weight, Heights, Body Mass Index (BMI), and Related Factors

Table 5 describes the sample in terms of their weights, heights and BMI. Mean weights and heights of different age groups among the sample were 72.6 kg and 165.1 cm for males, 66.2kg and 154.7 cm for females; while mean BMI for females and males were 27.7 and 26.6, respectively, both lie in overweight category, according to WHO - BMI classification (<18.5 = underweight, 18.5-24.9 = normal, 25-29.9 = overweight, 30-39.9 = obese, >40 =morbid obese)^{20,21}. In addition, the percentage of the obese and morbid obese females was 34.1% and 23.3% among the males. However, overall results of overweight showed that 36.7% of the males were overweight compared to 28.3% of the females.

Table 6 shows that the mean weights, heights and BMI were increasing gradually from the age 19 to around the 50 years of age and then decreasing from the age of 50 to 70+ years old, for both males and females. Figures 7, 8 and 9, show the distribution of mean weight, height and BMI of the sample classified by gender and age group, which in turn confirm the results reported in Table 6.

In general, less than 10% of the males and females were found to be under weight. The highest percentage of obesity in the males was among the age group of 30 to 49 years, and the decline in obesity starts after the age of 50 years. For the females the trend remained the same, however, the highest percentage of obesity was among age groups of 30 to 59 years and the highest BMI values were noted to be age group

40-49 years. In general, the prevalence of obesity among the females (34.1%) was higher compared to the males (23.3%) (Table 7), and while the obesity among the sample increases from ages 19 to 49 years, the underweight increases among the older age (50 to 70 + years) (Fig. 10). Table 8 shows the prevalence of obesity by geographic location of both sexes. These results do not indicate a significant correlation between the obesity and the geographic locations and the minor differences could be attributed to the population density only. Fig.11 & 12 show the obesity classification (overweight & obese) by education level for both males and females. It is noted that the percentage of overweight and obesity among the sample in both genders, are positively associated with the educational levels.

Figures 13 and 14 show obesity classification by occupation for males and females, respectively. The figures show that 23.9% and 18.6% of employed males were overweight and obese respectively. While 8.0% and 12.2% of the females who practice house work were overweight and obese, respectively.

Fig.15 shows the overweight and obesity classifications by physical activities. The figure shows that 46.7% of the overweight and obese male sample reported to practice certain forms of moderate to heavy physical activities compared to 47.6% of the overweight and obese females. However, it is to be noted that high percentage of female's physical activities comes from classifying the housework activities as moderate type.

D. Dietary Intake

1. Food Frequency Data

The frequency of consumption of food groups among the total sample is detailed in Table 9. The frequency of consumption by males, and females are shown in Tables

10a and 10b respectively.

Looking at the consumption rate in a week, 43.5% of the respondents reported daily consumption of fruits and vegetables. In addition, 25.8% reported an intake of 2-4 times a week, 14% reported an intake once a week, and 16% reported no intake. When fruit juices were excluded, the daily consumption rate reached 53.7% and only 10.7% reported no intake. Even though consumption patterns of fruits and vegetables were very similar among males and females, minor differences did exist (Tables 10a and 10b).

From the meat group, fish had the higher daily consumption rate of 42.7%. Another 42.7% reported fish intake 2-4 times a week, which means that 85.4% of the sample consume fish at least 2-4 times a week. Only 6% reported no intake.

Chicken is consumed mainly 2-4 times per week as reported by 52.5% of the sample, followed by meat as 39% reported the same consumption frequency. However, 24.4% and 54.2% reported no intake of chicken or meat respectively.

Legumes and nuts have low consumption rates, as 48.6% and 76.4% reported no intake in a week respectively.

For the milk group, 66.4% consume full fat milk and 50.2% consume milk products on a daily basis. Conversely, low fat milk is not favored, as 74% of the sample never used it, whilst only 13.7% consumed it daily.

Among the cereal and grains, bread is the most common as the daily intake reached 84.3% followed by the grains at 71.5%. The least common are pasta, cereals, and whole meal bread, as the no intake responses were 51%, 74.9%, and 77.3% respectively.

The daily consumption of snack foods is relatively low, as reported by only 10.9% of the sample. Additionally, 55.5% reported no intake in a week.

Cakes and pastries have even lower daily consumption that was 7.1%, and there was no intake for 56.4% of the sample.

On a daily basis, only 21.2% take fruit drinks, whereas 52.8% take soft drinks, and 73.5% take tea or coffee.

2. Dietary Intake Data

The completed dietary recalls were 100%, however, the completed micronutrients from these recalls were 86.7% due to some limitations of the Dankost 2000 database.

24 hours recall of dietary data for all respondents were compared to the means of energy intake, macro and micro nutrients to the Estimated Average Requirements (EARs) for United Kingdom Population ²². The mean intakes of energy and nutrients are presented in Tables 11 & 12 for both males and females. The data show that as the age increases there is, a clear, progressive decline in energy intake and the consumption of most nutrient values among both males and females. However, on average, (Table 11) the daily energy intake was almost 70% when compared to EARs standards for both sexes at all age groups, except for a small deficit for female of age 60+ years. The increase in total fat intake (Table 12) appears to reflect the changes in energy intake for both males and females in terms of increase of the mean intake during the early ages (19-50 years) for both males and females and decreases in the later ages (50+ years) for both sexes also.

Table 12 represents the mean distribution of daily nutrient Intakes of the sample for

macro and micronutrients compared to EARs standards intakes. In general the intakes were found to be adequate or more to that reported in EARs of the study population, mainly for protein, thiamin, riboflavin, vitamin B12, vitamin C, phosphorus, and sodium. Nevertheless, Niacin intake was shown to be extremely low, which was not reasonable for the Bahraini population, and expected to be a result of underestimation by the food database used.

Iron intake was adequate among the total male sample and the older females (50+ years of age). However, females aged 19-50 years showed inadequate intake.

For vitamin A, the intake was adequate among the sample up to 50 years of age. However, in the older age groups the intake was inadequate for both males and females.

In comparison, inadequate intakes compared to the RNIs were found for Vitamin B6, Magnesium, Copper, Potassium, and Calcium.

Folate and Zinc intakes were also inadequate except for younger males (19-50 years of age).

Table 13 shows that the mean percentage of energy derived from proteins, carbohydrates, and fats, were relatively higher among the 19-50 years old than those over the age of 50+, for both males and females. However, only the mean percent of energy from protein intake among the 19-50 years age group for both males and females, was found higher than 15% recommended by World Health Organization (WHO).

The mean value of some nutrients taken by the sample in comparison to the American recommended amounts per 1000 kcals ²⁴, are shown in Table 14. It is

observed that the intake of polyunsaturated and monounsaturated fats were 5.5% and 0.1% of the American recommendations. These are relatively low values compared to saturated fats (24.5%). Also the intake of dietary fibers was only 47% of American recommendations. On the other hand, the carbohydrate and total fat intakes of the sample were almost equal to the American recommended amount.

E. Anemia Data

Table 15 present data on the presence of Anemia among the sample of various age groups, classified according to WHO criteria (for adult males Hb < 13 g/dl, and for adult females (non-pregnant) Hb < 12 g/dl)¹⁹.

The data show that the overall mean value of blood hemoglobin levels were below the standard levels among different age groups, (males 11.6 g/dl, and females 10.7 g/dl) for both males and females. However, the percentage of prevalence of Anemia cases was higher in females 37.3% compared to the males 20.9% (Table 15).

VII. DISCUSSION

1. Socio-demographic factors: -

The present survey indicates high prevalence of overweight (males 36.7%, females 28.3%) and obesity (male 23.3%, females 34.1%), compared to few underweight (males 4.3%, females 5.9%) and normal range of BMI (males 35.8%, females 31.8%) using WHO criteria²¹. Furthermore, there were no significant differences in the anthropometric readings among various regions in Bahrain, which suggest that the urban and the rural regions are close in their socio-economic status.

Obesity has been classified as an independent risk factor for many chronic diseases including heart diseases, type II diabetes mellitus, osteoporosis, and hypertension^{24, 25, 26}. Hence these results suggest that the studied segment of the population may be at a higher risk of nutrition related health problems.

Furthermore, based on the self-reported data on the practice of physical activity and occupation, results showed that the sedentary and standing type of works comprised most of the reported occupation. Although 47% of the obese and overweight samples (males and females) reported practicing moderate to heavy physical activity, in general, the data seems to reflect that the sedentary lifestyle of the adult population may be a major contributory factor in causing the obesity among this age group.

Moreover, no significant association was found between the level of education, household income, and the trend toward overweight and obesity.

2. Dietary Factors

The present survey indicates also that the majority of the subjects were found to consume high amounts of protein, fat, carbohydrates and some vitamins and minerals. This was mainly due to the high consumption of meat & meat products (fish, chicken, and red meat) in addition to bread, rice and reasonable amounts of fruits and vegetables.

When the mean values of some types of nutrients, per 1000 kcals, were compared to those of the American recommendations (Table 14), the findings were; 107.8% for carbohydrate, 94.5% for total fats, 24.5% for saturated fat, 0.1% for monounsaturated fat, 84.7% for cholesterol and 47% for dietary fiber, of the percentage of the American recommendations.

Under reporting of the true habitual food intake is a major problem in self reported dietary studies. This results in low energy intake of some respondents known as low energy reporters (LERs)^{28,29}.

Following other studies, LERs were defined as those reporting an intake below 1.1 BMR^{28,30}.

In this study, LERs were 1232 (53.5%) of the total sample. Of these, 514 (41.7%) were males and 718 (58.3%) were females. It was found that only 3.5% of the LERs were underweight, 27.7% were normal, 33.8% overweight and 35% were obese (Table 16).

In general, most LERs aged 19-29 years were overweight, those aged 30-59 were mainly obese, whereas in older LERs (60+) were mostly of normal weight. Among males, it was found that most LERs were overweight, except for those aged 70+ years who were mostly normal 45.8% or overweight 40.6%.

Young female LERs (19-29 years) were either normal (36.7%), overweight (34.7%) or obese (27.6%). The LER females aged 30-59 years of age were mostly obese, and those aged 60+ years were mostly normal.

There could be several explanations for the low energy intake reported by these respondents such as the survey period might have coincide with a period of low energy intake, or that respondents may have changed their diet during this period. However, the most likely reason for low energy reporting is incomplete recording of food intake²⁸.

Some studies have suggested that consuming dairy products on regular basis exert a protective effect against osteoporosis and hypertension¹². This effect has been attributed to the Calcium element in the dairy products. On the other hand, this

study revealed that the intake of calcium was above 80% for males and 70% for females of the reference nutrient intakes for UK population. Although the results showed that the calcium intake is reasonable among the adult Bahraini population, yet the reported cases of Osteoporosis are relatively high.

Therefore, it could be suggested that the relationship of dietary factors to Osteoporosis among Bahraini adults needs further investigations.

The relationship of dietary sodium and potassium with blood pressure has been reported in many studies ¹². Several studies have reported a negative correlation between potassium and blood pressure and a positive correlation between sodium and blood pressure ^{31,32}. The results show that the sodium intake was three times the UK standards, while the potassium intakes were only 55% of the UK standards. This might highlight the increased incidence of hypertension among Bahraini adults.

On the other hand, it was found that the magnesium intake of the sample was on average below 50% of the UK standards. It was suggested in some reports that dietary magnesium is inversely correlated with blood pressure ^{12,33}. As per the self reported health status of the samples, 16.4% of them mentioned having high blood pressure. Being self-reported information, it is expected that the actual figure among the adult population in Bahrain to be higher.

Regarding iron intake, females aged 19-50 years showed inadequate intake due to the increased requirements in this period of life, as the mean intake is not much lower than that of females in the other age group.

The mean energy intake for both males and females was significantly associated with the increase in income (Fig.16).

As expected, the increased prevalence of overweight and obesity is thought to be a result of increased abundance of calorie-dense foods, and decreased levels of physical activity, which comes in concordance with the results of other studies³⁴.

2. Anemia

Results obtained from measuring blood hemoglobin levels showed that 21% and 37% of males and females, respectively, to be anemic. However, the dietary analysis in this survey showed that the dietary Iron and Vitamin B12 intake of the subjects were adequate. This might be due to the inadequate intakes of dietary folic acid³⁵, or dietary vitamin B6³⁶, or other genetic blood disorders causing anemia. Furthermore, the coffee and tea which are known to reduce the body's capability in absorbing iron are among the favorite drinks and highly consumed in Bahrain. Hence, this indicates a need for more data on the bio availability of Iron.

VIII. CONCLUSIONS

1. The sedentary lifestyle and high intake of protein and fat foods are combinedly associated with the clear trend of obesity among the adult population.
2. The high intakes of fat foods and low intakes of fiber and antioxidant foods among the sample increase the risk of chronic diseases.
3. The average intake of dietary sodium in the total sample was high, while potassium and magnesium intakes were low.
4. The total calcium intake among the sample found to be adequate despite the relatively high reported incidences of osteoporosis in Bahrain.
5. Prevalence of Anemia among the studied sample could be attributed to deficiency of folic acid and unhealthy dietary habits and other hereditary factors.

IX. RECOMMENDATIONS

In the light of this survey, the following elements are recommended:

1. To establish a National Task Force to control & treat Obesity in the country.
2. Raising the public awareness toward healthier food choices, mainly toward reducing the high fat, protein, and simple carbohydrate food-intakes, and encourages the intakes of vitamins, minerals, and fiber foods (fruits, vegetables, whole bread, and legumes).

3. Identification and implementation of programs and strategies to combat sedentary lifestyle and smoking habits among the population, and to increase the awareness on the importance of physical activity.
4. Highlight, to the public, the role of diet in causing and preventing diet-related chronic diseases.
5. Establish and implement a comprehensive dietary surveillance of the population to monitor dietary changes and to evaluate the public awareness as well as the public health programs.
6. To establish a comprehensive national program to control & prevent anemia.
7. Introducing healthy dietary habits as part of the school curriculum.
8. To investigate the relationship of dietary factors to osteoporosis among Bahraini population.
9. Future surveys should consider the inclusion of weekend sampling.
10. More data is needed on the bioavailability of Iron.

X. LIMITATIONS

1. Frequently, individuals or families were not at home for the scheduled appointment, therefore interviewers visited the next household in the selected segment, which showed a high percentage of housewives among female sample.
2. The dietary intake estimates for the population were assessed using a single 24-hour dietary recall, which contains a considerable within person variation.
3. Incorrect or incomplete reporting of the dietary recall data.
4. The dietary database used (Dankost) had many limitations, such as lack of readings of some nutrients (vitamin k, sugars, starch,...), and over/underestimation of some other nutrients (such as vitamin D and Niacin).

XI. REFERENCES

1. Musaiger A.O.: The State of Food and Nutrition in Bahrain. Unicef, Gulf Area Office, Riyadh, Saudi Arabia. Awall Press, Bahrain ; 1993.
2. Musaiger A.O.: Nutritional disorders associated with affluence in Bahrain. Family practice, 1990; 7:9-13.
3. "Household Expenditure and income Survey (94/95)" Central Statistic Organization. State of Bahrain.
4. Gharib N., Moosa K., et. Al. Assessment of Nutritional Status of Elderlys in Elderlys Home Care Centers, 1997, (Unpublished paper).
5. Ministry of Health: Health Abstract 2000. Health Information Directorate, June 2001, Bahrain.
6. Hulshof K.F.A., Wedel M., L|wik M.R.H., et.al.: Clustering of Dietary Variables and Other lifestyle Factors (Dutch Nutritional Surveillance System). J Epidemiol Community Health, 1992; 46 : 417-424.
7. Gonzalez M.A.M, Azpiazu I.L., Kearney J., et.al: Definition of Healthy Eating in the Spanish Adult Population: a National Sample in a Pan-European Survey. Public Health 1998 ; 112, 95-101.
8. Al- Mannai A., Dickerson J.W.T, Morgan B.J, and Khalfan H.:. Obesity in Bahraini Adults. J Roy Soc Health, Feb. 1996.
9. Moosa K., zein Z.A.: Assessment of the Iron Status and Dietary Intakes of

Pregnant Women in Bahrain. Feb. 1996; Ministry of Health, Bahrain.

10. Blair D., and Gregory W.B. : The Nutrition Status of Bahraini Schools Girls aged 7-18 years old. Bahrain Sport Institute; Bahrain 1985.
11. White I, Goldberg H, Gilbert T, Ballew C, Mendlein J, Peter D, Percy C, and Mokdad A, 1997. Rationale, Design and Methodology for the Navajo Health and Nutrition Survey. *The Journal of Nutrition*, 127; 2078S - 2084S.
12. Tian H.G, Nan Y., Hu G., et.al. : Dietary Survey in a Chinese Population. *European J. Clinical Nutrition*. 1995; 49, 26-32.
13. Ghadirian P., Shatenstein B. : Nutrient Patterns, Nutritional Adequacy, and Comparisons with Nutrition Recommendations Among French-Canadian Adults in Montreal. *J American College of Nutrition*, 1996; 15, No. 3 : 255 - 263.
14. Briefel R.R., Mc Dowell M.A., Alaimo K., et. Al. : Total energy intake of the US population : the third National Health and Nutrition Examination Survey, 1988- 1991. *Am J Clin Nut*, 1995; 62 (suppl): 1072S-80S.
15. Taylor R., Badcock J., King H., et. Al. : Dietary Intake, Exercise, Obesity and Noncommunicable Diseases in Rural and Urban Populations of Three Pacific Island Countries. *J American Collage of Nutrition* ,1992; vol. 11, No. 3: 283-293.
16. Faber M, Jogessar VB and Benade AJS, 2001. Nutritional status and dietary intakes of children aged 2-5 years and their caregivers in a rural South African community. *International Journal of Food Science and*

Nutrition; 52,401-411.

17. Briefel R, Bialostosky K, Kennedy-Stephenson J, McDowell M, Ervin R, and Wright J, 2000. Zinc Intake of the U.S. Population: Findings from the Third National Health and Nutrition Examination Survey, 1988-1994. *Journal of Nutrition*; 130:1367S-1373S.
18. McCrory M.A., Fuss P.J., McCallum J.E., et. Al: Dietary Variety within Food Groups: association with energy intake and body fatness in men and women. *Am J Clin Nutr.* 1999; 69:440-7.
19. "Guidelines for the Control of Iron Deficiency in Countries of the Eastern Mediterranean Middle East and North Africa". Based on a joint WHO/Unicef Consultation on strategies for the control of Iron Deficiency Anemia. Tehran, Islamic Republic of Iran; 22-26 Oct; 1995.
20. Report of a WHO Expert Committee. Physical Status: The use and Interpretation of Anthropometry. WHO Technical Report Series (854). Geneva, 1995.
21. Obesity: Preventing and Managing the Global Epidemic. Report of a WHO Consultation. World Health Organization. Geneva, 2000.
22. "Dietary Reference Values for Food Energy and Nutrients for the United Kingdom" Report on Health and Social Subjects. Department of Health. London. 1996.
23. "Statistical Abstract 1997". Central Statistic Organization. State of Bahrain, Jan. 1999.

24. Lee R.D., Nieman D.C.,: Nutritional Assessment. WCB/McGraw-Hill. 2nd Edition, 1996.
25. Bell M., Wilbur L., Smith C. : Nutritional Status of Persons using a local emergency food system program in middle America. J Am Diet Ass. Sept. 1998; Vol. 98 (9) : 1031-1033.
26. Flegal K.M., Carroll M.D., Kuczmarski R.J., Johnson C.L.: Overweight and Obesity in the United State: Prevalence and Trends, 1960-1994. Int J Obes, 1998; 22:39-47.
27. Grundy S.M.: Multifactorial causation of obesity : implications for prevention. Am J Clin Nutr, 1998; 67 (suppl): 563S-72S.
28. Cook A, Pryer J, and Shetty P, 2000. The problem of accuracy in dietary surveys. Analysis of the over 65 UK National Diet and Nutrition Survey. Journal of Epidemiology and Community Health, 54: (8): 611-616.
29. Black AE, Cole TJ, 2001. Biased over- or under-reporting is characteristic of individuals whether over time or by different assessment methods. Journal of the American Dietetics Association; 101 (1): 70-80.
30. Price GM, Paul AA, Cole TJ, Wadsworth ME, 1997. Characteristics of the low-energy reporters in a longitudinal national dietary survey. British Journal of Nutrition; 77 (6): 833-51.
31. Bulpitt C.J., Broughton P.M.G., Markowe H.L.J. et. Al.: The relationship between both sodium and potassium intake and blood pressure in London civil servants. J.Chron Dis. 1986; 93(3), 211-219.

32. Khaw K.T., Barrett-Connor E.: Dietary potassium and blood pressure in a population. *Am J Clin Nutr.*, 1984; 39, 963-968.
33. Joffers M.R., Reed D.M., and Yano K. : Relationship of magnesium intake and other dietary factors to blood pressure : The Honolulu heart study. *Am J Clin Nutr.*, 1987; 45, 469-475.
34. White L, Ballew C, Gilbert T, Mendlein J, Mokdad A, and Strauss K, 1997. Weight, Body Image, and Weight Control Practices of Navajo Indians: Findings from the Navajo Health and Nutrition Survey. *The Journal of Nutrition*, 127: 2094S-2098S.
35. Arteaga L.A. : The Nutritional Status of Latin America Adults. *Basic Life Sci.*, 1976; 7: 67-76.
36. L.Mahan, and S. Escott-Stump, 2000. *Food, Nutrition, & Diet Therapy*. W.B. Saunders company, page 131.

APPENDICES

**"National Nutrition Survey
in Bahrain"**

**Health and Lifestyle
Questionnaire**

**Nutrition Section
Public Health Directorate
Ministry of Health**

1997

11. Marital status:
- | | |
|-------------------|--------------------------|
| Single | <input type="checkbox"/> |
| Currently Married | <input type="checkbox"/> |
| Widowed | <input type="checkbox"/> |
| Divorced | <input type="checkbox"/> |
| Separated | <input type="checkbox"/> |

12. Educational Status:
- | | |
|--------------------------|-----------------------|
| <input type="checkbox"/> | Illiterate |
| <input type="checkbox"/> | Less than High School |
| <input type="checkbox"/> | High school |
| <input type="checkbox"/> | University |

13. Current occupation:
- | | | |
|-------------------------|--------------------------|----------------------------|
| Employed | <input type="checkbox"/> | describe (Job title) _____ |
| Housewife (Home duties) | <input type="checkbox"/> | |
| Retired | <input type="checkbox"/> | |
| Unemployed | <input type="checkbox"/> | |
| Student | <input type="checkbox"/> | |
| Other | <input type="checkbox"/> | describe _____ |

14. Number of family (count yourself, children, parents, others who live in your home)

15. The approximate household total income per month (Including income from all sources for all members living with you):

- | | |
|----------------|-----------------------------|
| Not Applicable | <input type="checkbox"/> |
| < 150 | BD <input type="checkbox"/> |
| 150 - 350 | BD <input type="checkbox"/> |
| 350 - 550 | BD <input type="checkbox"/> |
| 550 - 750 | BD <input type="checkbox"/> |
| > 750 | BD <input type="checkbox"/> |

16. Has your doctor ever told you that you had any of the following?

	Yes	No	Don't know	Date first Diagnosed (year)
High blood pressure (hypertension)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
High blood cholesterol (hyperlipidaemia)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
Heart attack	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
Stroke	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
Cancer	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
Diabetes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
Stomach problems, e.g. ulcers	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
Bowel problems, e.g. Irritable bowel	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
Asthma	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
Allergie	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
Osteoporosis	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
Fractures	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
Psychiatric Illness	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
Obesity	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>
Others	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/>

Specify _____

17. Do you smoke? Yes No
 If Yes, What Type do you smoke?

- Cigarettes
- Pipe
- Cigars
- Nargila (Shisha)
- Others Specify _____

18. Do you follow any particular diets ? Yes No Don't know

- Low fat
- Low salt
- Diabetic
- Weight reduction
- Vegetarian
- High fibre
- Other (give details) _____

19. What type and amount of physical activity involved in your work.

- Sedentary occupation
(you spend most of your time sitting, such as in an office or driving a vehicle)
- Standing occupation
(you spend most of your time standing or walking. However, your work does not require intense physical effort, e.g. Nurse, Teacher, guard, shop assistant, .. etc.)
- Manual work
(this involves some physical effort including handling of heavy objects and use of tools, e.g. plumber, electrician, carpenter, ... etc.)
- Heavy manual work
(this implies vigorous physical activity including handling of very heavy objects, e.g. Docker, factory worker, construction worker, ... etc.)

20. In a typical week, do you practice any of the following activities ?

- Walking
- Cycling
- Gardening
- Physical exercise, such as aerobics, swimming, jogging, tennis, .. etc.
- Housework, such as cleaning, washing, cooking, child care,..etc.
- Others
Specify _____

21. In the last week, have you taken any drugs or medicines, either prescribed by your doctor or bought from the pharmacy? (please include inhalers, pain killers, vitamins, minerals or other food supplements, etc.)

Yes No Don't know

If yes, please name them:

	Name/Brand	Daily Dose
1.	<input type="text"/>	<input type="text"/>
2.	<input type="text"/>	<input type="text"/>
3.	<input type="text"/>	<input type="text"/>
4.	<input type="text"/>	<input type="text"/>
5.	<input type="text"/>	<input type="text"/>
6.	<input type="text"/>	<input type="text"/>

22. Food Frequency Questionnaire :

How often do you eat the following foods ?

	Never	Seldom	Once a week	2-4 times a week	5-6 times a week	Once or more daily	Don't know
Fresh fruit (apples, oranges, pears)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Green leafy vegetables (lettuce, cabbage, berbeer, endive, spinach,)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other vegetables (carrots, tomatoes, cucumber,..)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fish	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Chicken	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Meat	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Meat products (sausages, burgers, shawarma,..)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Eggs	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Legumes (Lentils, beans, peas,...)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Milk, full fat	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Milk, low fat or skimmed	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Milk products(cheese, yogurt, milk drinks,..)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nuts (pistachio, casheonuts,..)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bread, white	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Bread, wholemeal/brown	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
cereals (corn flakes, oatmeal,..)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pasta (spaghetti, macaroni, noodles, grits,..)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Grains (rice,	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Snack foods (potato chips, popcorn, candies, chocolates..)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cakes & Pastries (cakes, biscuits, sweet pies,..)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Soft drinks (cola drinks)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fruit Juices	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Fruit drinks	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Coffee/tea	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Alcoholic beverages	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Others:							

**“National Nutrition Survey
in Bahrain”**

24 Hour Diet Recall

**Nutrition Section
Public Health Directorate
Ministry of Health**

FIGURES & TABLES

Table 1. Demographic Characteristics of the Sample

Variable	Males (n=1120)	Females (n=1181)	Total (n=2301)
Age Groups(Years)	No (%)	No (%)	No (%)
19-29	212 (18.9)	203 (17.2)	415 (18)
30-39	221 (19.7)	217 (18.4)	438 (19)
40-49	173 (15.4)	214 (18.1)	387 (16.8)
50-59	177 (15.8)	200 (16.9)	377 (16.4)
60-69	197 (17.6)	190 (16.1)	387 (16.8)
70+	140 (12.5)	157 (13.3)	297 (12.9)
Geographic Distribution			
Manama	14.7 (165)	17.4 (205)	16.0 (370)
Muharraq	18.2 (204)	18.3 (216)	18.2 (420)
Isa Town	10.2 (114)	9.6 (113)	5.4 (127)
Jidhafs	9.2 (103)	12.2 (114)	10.6 (247)
Riffa	8.1 (91)	7.3 (86)	7.6 (177)
Sitra	8.8 (98)	8.6 (101)	8.5 (199)
Western	7.1 (80)	5.0 (59)	6.0 (139)
Hamad Town	7.2 (81)	6.0 (71)	6.6 (152)
Central	7.9 (88)	7.5 (88)	7.5 (176)
Northern	5.5 (62)	5.7 (67)	5.5 (129)
Hidd	3.0 (34)	2.6 (31)	2.7 (65)
Education			
Illiterate	188 (16.8)	390 (33.1)	578 (25.2)
<H.School	639 (57.2)	543 (46)	1182 (51.4)
>H.school	291 (26)	247 (20.9)	538 (23.4)
Occupation			
Employed	676 (60.5)	361 (30.6)	1037 (45.1)
House Duties	9 (0.8)	752 (63.7)	761 (33.1)
Retired	224 (20)	9 (0.8)	233 (10.1)
Unemployed	135 (12.1)	27 (2.3)	162 (7)
Student	16 (1.4)	28 (2.4)	44 (1.9)
Marital Status			
Single	170 (15.2)	145 (12.3)	315 (13.7)
Married	918 (82)	773 (65.5)	1691 (73.5)
Widowed	26 (2.3)	224 (19)	250 (10.9)
Divorced	5 (0.5)	39 (3.3)	44 (1.9)
Household Income Monthly(BD)			
< 150			532 (23.1)
150 - 349			802 (34.9)
350 - 549			425 (18.5)
550 - 749			191 (8.3)
>750			177 (7.7)
Not Reported			174 (7.6)
Family Size			
<4	127 (11.4)	142 (12)	269 (11.7)
4-6	351 (31.4)	341 (28.9)	692 (30.1)
>6	639 (57.2)	697 (59.1)	1336 (58.2)

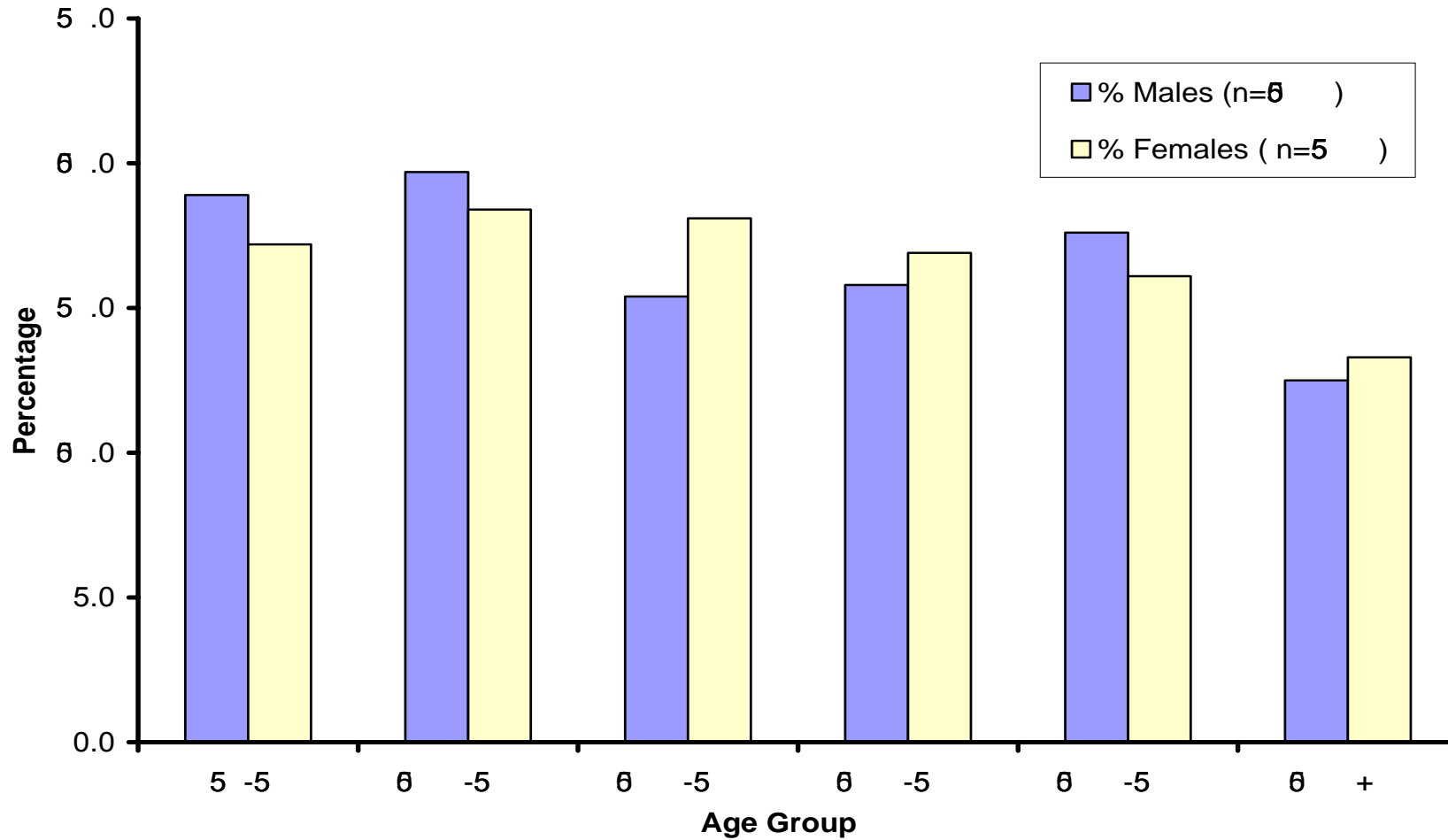


Fig. 1 Percentage Distribution of the Sample Classified by Gender and Age

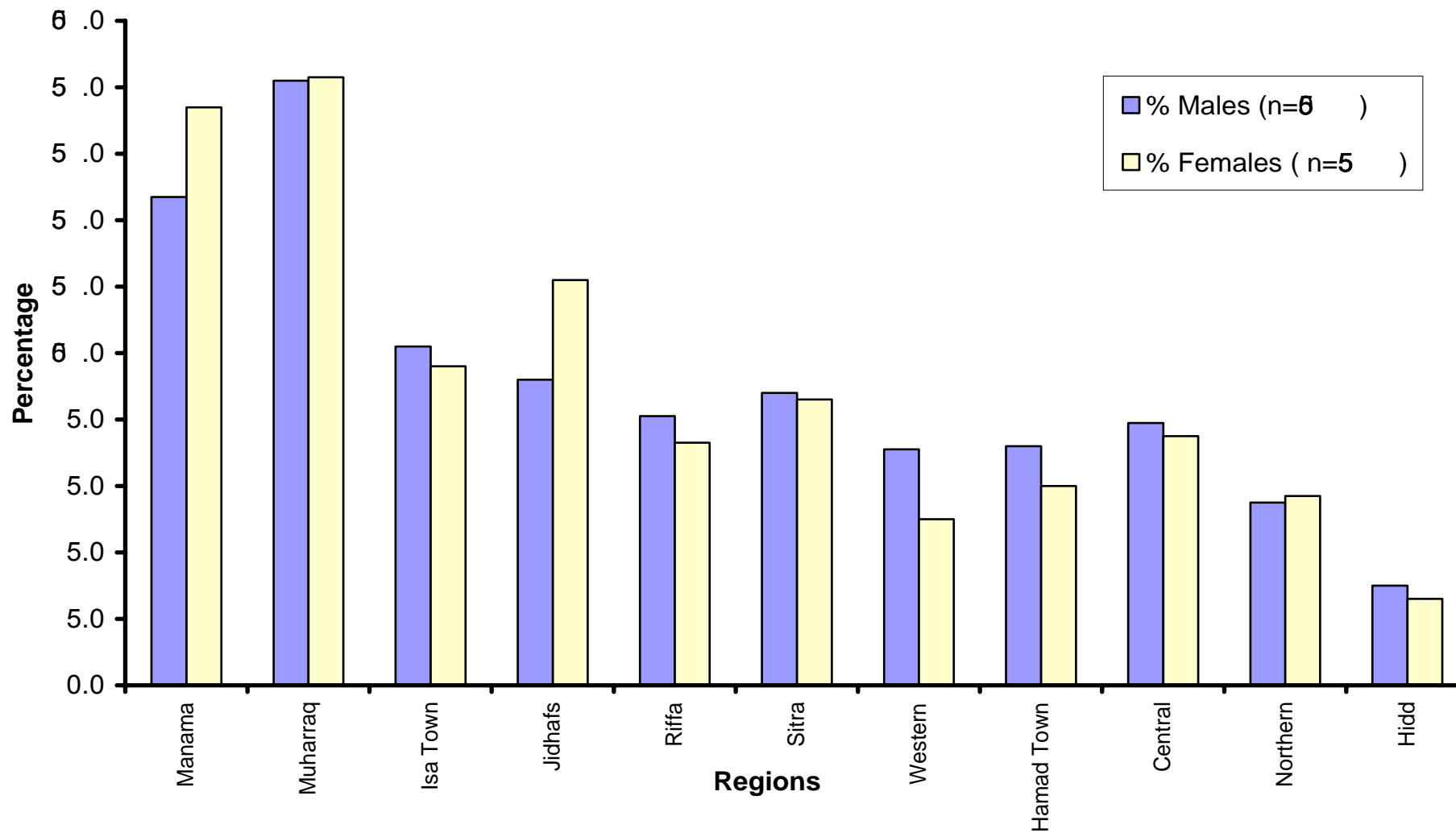


Fig. 5 Percentage Distribution of the Sample Classified by Geographic Regions

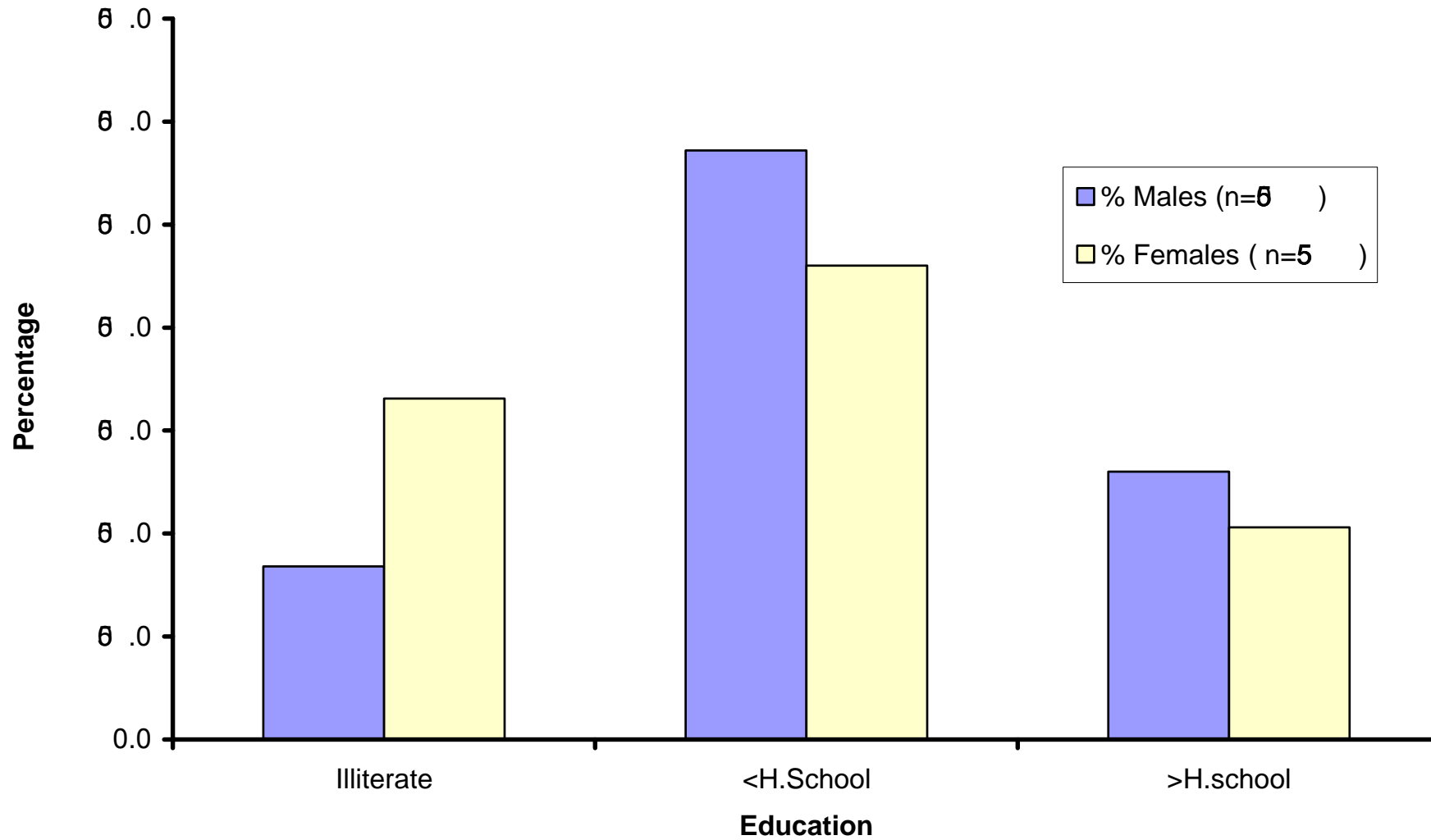


Fig.5 Education Levels of the Sample

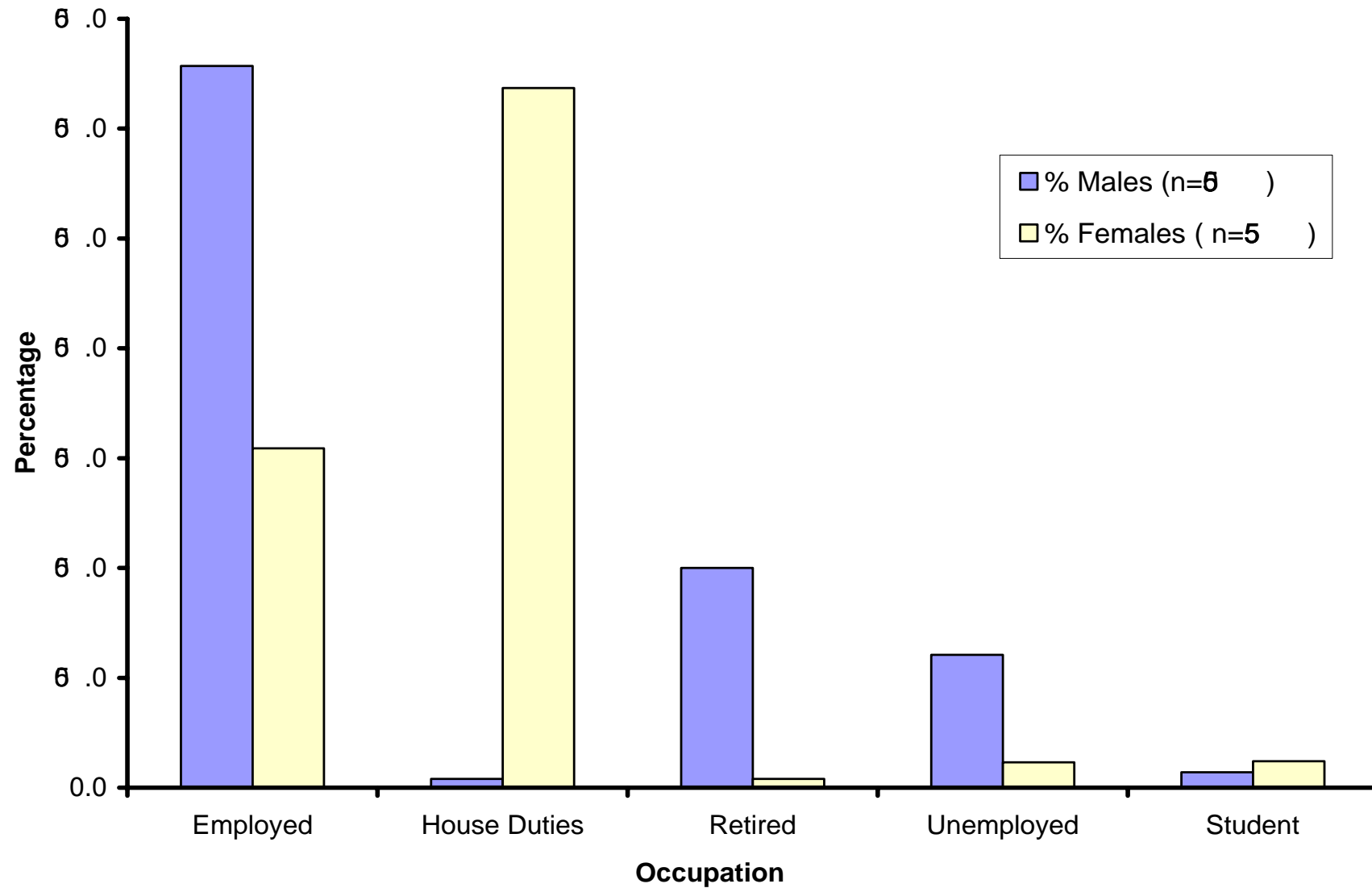


Fig. 5 Occupation Status of the Sample

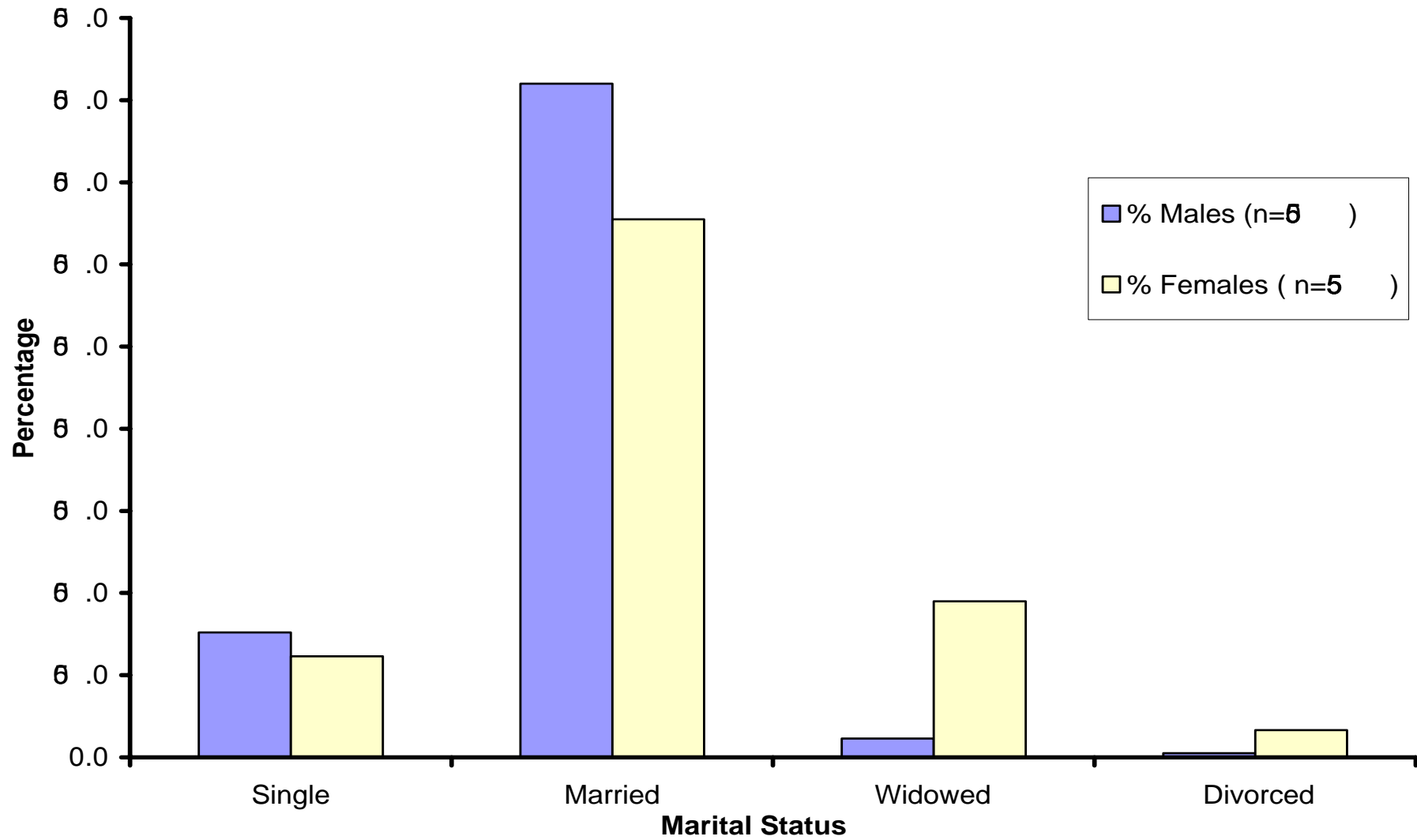


Fig. 5 Marital Status of the Sample

Table (2) Health - Related Indices				
Variable		Males (n=1120) %	Females (n=1181) %	Total (n=2301) %
Smoking				
Yes		29.5	18.6	23.9
No		70.5	81.4	76.1
Type of Physical Activity Involved in Occupation *				
Sedentary		32.1	27.8	28.4
Standing		50.3	70.2	62
Light Manual		13.7	1.4	7.4
Heavy Manual		3.9	0.6	2.2
Physical Activity				
Yes		80.1	83.3	81.7
No		19.9	16.7	18.3
Self Reported History Diagnosed Chronic Diseases				
Hypertension	Yes	21.1	20.6	16.4
	No	87.9	79.5	83.6
Heart Attack	Yes	3.4	4.9	4.2
	No	96.6	95.1	95.9
Stroke	Yes	0.5	0.3	0.4
	No	99.5	99.7	99.6
Diabetes	Yes	13.3	15.6	14.5
	No	86.7	84.4	85.6
Hypercholesterolemia	Yes	1.9	3.9	2.9
	No	98.1	96.1	97.1
Cancer	Yes	0.6	0.8	0.7
	No	99.4	99.2	99.3

* Sedentary : sitting type of work e.g. office works

Standing :standing or walking type of work e.g. Nursing, Teaching, Guarding, Shop assisting, ..etc.

Light Manual : Involve some Physical effort e.g. Pluming ,electrical work , Carpenting ,... etc.

Heavy Manual:Implies vigorous Physical activity e.g. Docking, Factory, Construction...etc

Table 3. Smoking Behavior Among the Sample According to Age, Education Level and Type of Smoking

Sex	* Males n=330		* Females n=220		Total n= 550	
	No.	%	No.	%	No.	%
Age Groups (years)						
19-29	58	17.6	7	3.2	65.0	11.8
30-39	69	20.9	15	6.8	84.0	15.3
40-49	54	16.4	43	19.5	97.0	17.6
50-59	52	15.8	51	23.2	103.0	18.7
60-69	57	17.3	63	28.6	120.0	21.8
70+	40	12.1	41	18.6	81.0	14.7
Total	330	100	220	100	550	100
Education						
Illiterate	100	30.3	190	86.3	290.0	52.7
<High School	189	57.3	29	13.2	218.0	39.6
> High School	41	12.4	1	0.5	42.0	7.6
Total	330	100	220	100	550	100.0
Type Of Smoking						
Cigarettes	238	72.1	5	2.3	243.0	44.2
Pipe	0	0.0	3	1.4	3.0	0.5
Cigars	11	3.3	0	0.0	11.0	2.0
Shisha	35	10.6	211	95.9	246.0	44.7
Cigarettes + Shisha	46	13.9	1	0.5	47.0	8.5
Total	330	100	220	100	550	100

* Percentage of smokers Males and Females From the Total Sample were : Males = 29.5% , Females = 18.6%

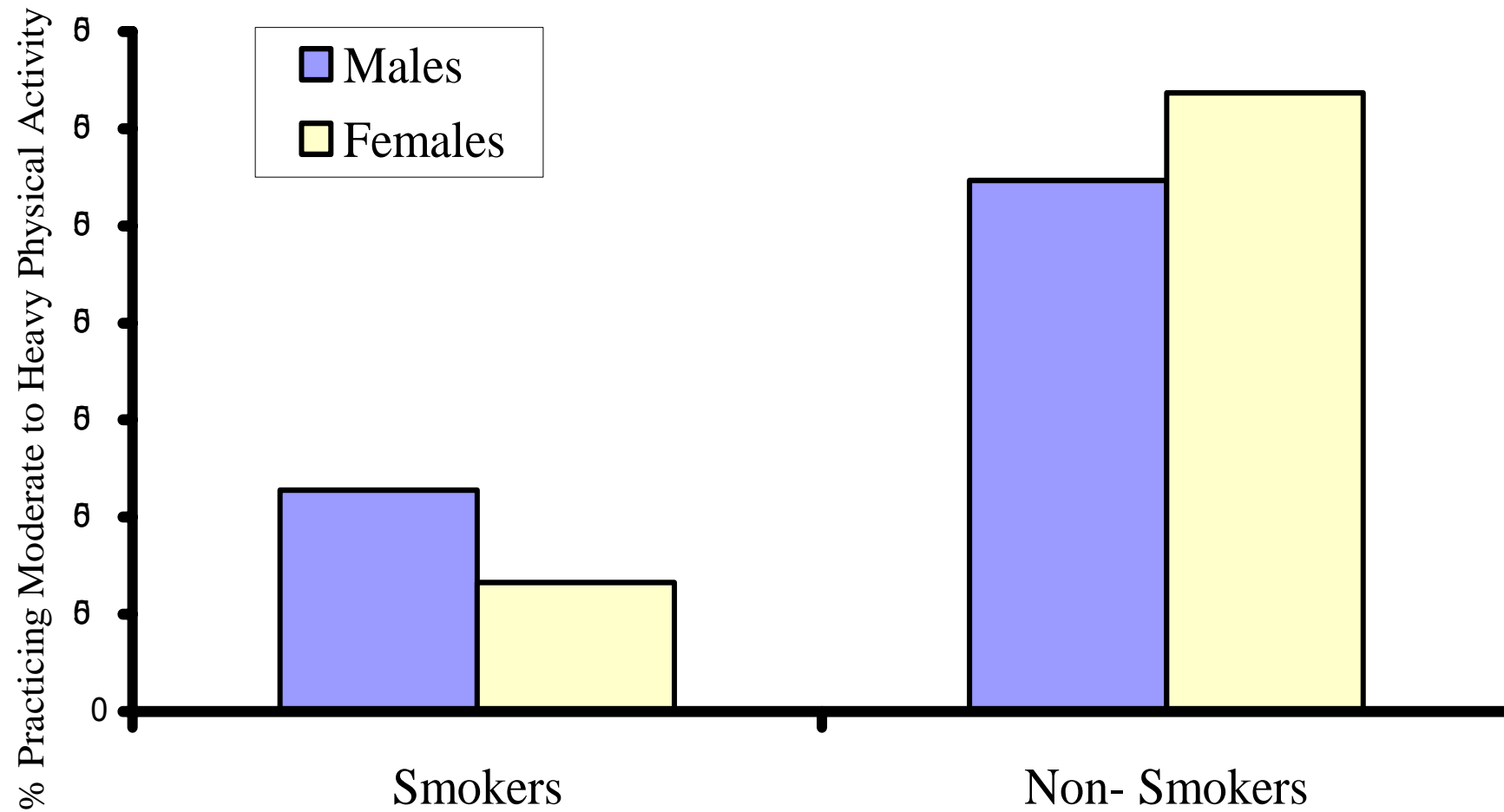


Fig. 6 Physical Activity Behavior Among Males and Females Smokers and Non-Smokers

Table 4. Physical Activity Practice Among The Sample According to Age and Sex

Age Group (Years)	Males (n= 997)				Females (n=858)			
	No.	None	Moderate*	Heavy **	No.	None	Moderate*	Heavy **
		%	%	%		%	%	%
19-29	171	2.6	9.1	5.4	146	2.9	13.2	0.9
30-39	190	4.8	11.5	2.7	142	3	12.6	0.9
40-49	145	2.4	10.6	1.5	135	2	13.6	0.4
50-59	168	3.8	12.7	0.4	146	2.6	14	0
60-69	186	4.4	13.9	0.4	157	6.2	12.1	0
70+	137	4.5	9.3	0	132	7.6	8	0
Total	997	22.5	67.1	10.4	858	24.3	73.5	2.2

* Moderate = Walking + Housework + Fishing + Gardening+.....

** Haevy = Physical Exercise + Jogging + Cycling+.....

Table 5. Descriptive Data of the Sample				
Variable	Males (n=1120)		Females (n=1181)	
Weight (kg) [Mean (SD)]	72.6	(14.9)	66.2	(16.4)
Height(cm) [Mean (SD)]	165.1	(9.0)	154.7	(7.8)
Body mass index(BMI) [Mean (SD)]	26.6	(5.4)	27.7	(6.9)
* BMI Distribution (%)				
<18.5 (underweight)	4.3		5.9	
18.5 - 24.9 (Normal)	35.8		31.8	
25 - 29.9 (Overweight)	36.7		28.3	
30 – and above (Obese)	23.3		34.1	
Hemoglobin(g/dl)				
All [Mean (SD)]	11.6	(1.03)	10.7	(0.95)
** Anemic(%)	20.9		37.3	
Non Anemic (%)	64.2		52.5	
Not Tested(%)	14.9		10.2	

*BMI Classification According to WHO Criteria (20)

**Anemia is Defined According to WHO (19) as Follows:

Males Hb < 13 (g/dl)

Females Hb < 12 (g/dl)

**Table 6. Mean Weights , Heights and Body Mass Index
of the Sample According to Age and Sex**

Age Group	Weight		Height		BMI	
	Mean	(SD)	Mean	(SD)	Mean	(SD)
Males						
19 - 29	71.5	(14.4)	167.9	(10.1)	25.5	(6.8)
30 - 39	77.7	(14.5)	167.6	(8.2)	27.7	(5.0)
40 - 49	78.3	(13.0)	166.0	(7.8)	28.3	(4.4)
50 - 59	74.2	(14.5)	165.0	(7.9)	27.3	(5.2)
60 - 69	69.3	(14.0)	162.2	(7.8)	26.3	(5.4)
70+	61.8	(13.0)	160.1	(9.7)	24.1	(4.4)
Females						
19 - 29	62.7	(15.5)	156.5	(6.7)	25.6	(6.1)
30 - 39	69.2	(14.4)	156.6	(6.5)	28.3	(6.1)
40 - 49	73.7	(17.1)	155.4	(7.2)	30.6	(7.4)
50 - 59	69.4	(15.5)	154.5	(8.1)	29.1	(6.2)
60 - 69	62.1	(15.8)	152.5	(8.7)	26.9	(7.7)
70+	57.1	(14.6)	151.3	(8.8)	24.9	(6.2)

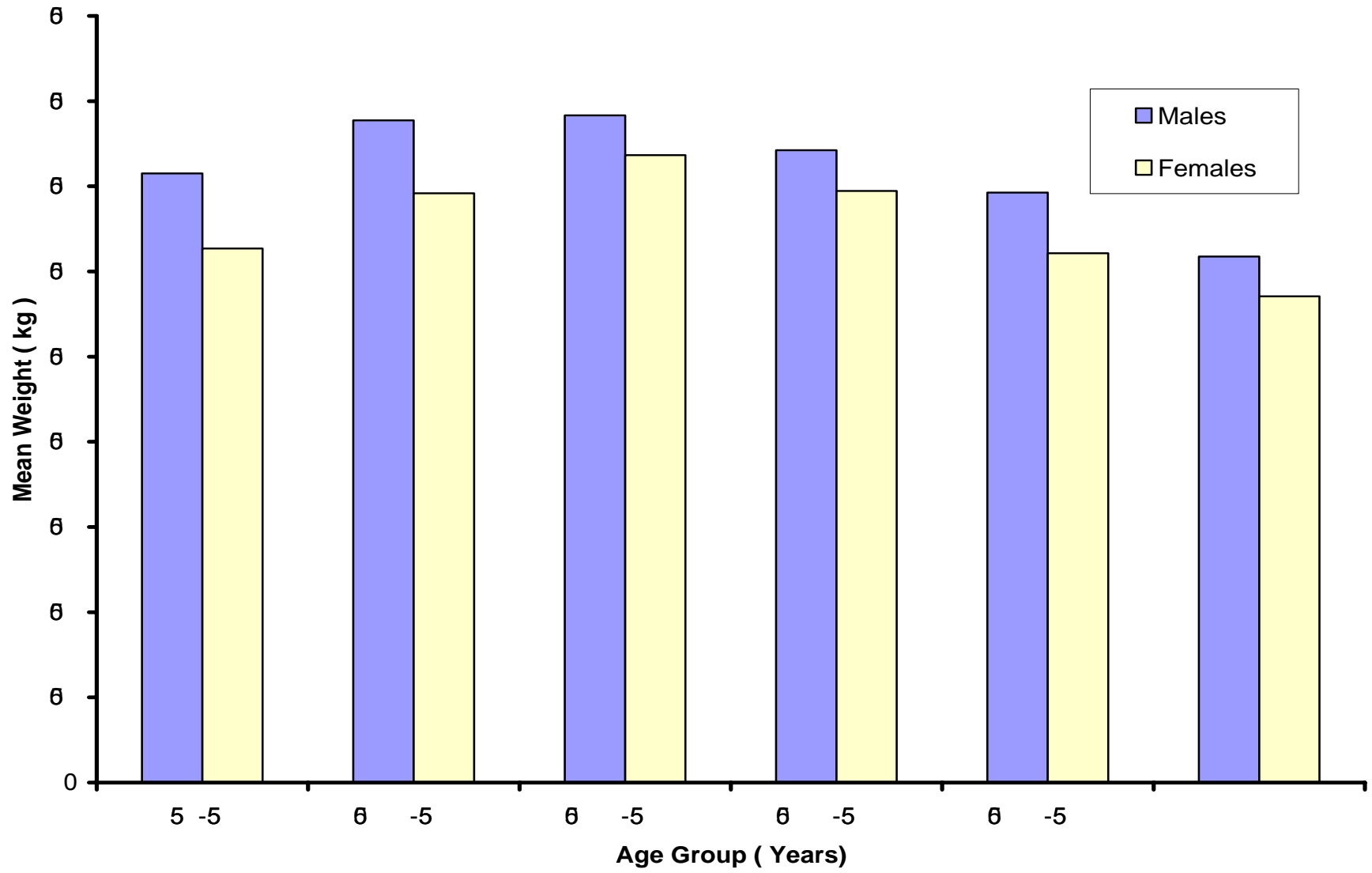


Fig. 5 Mean Weight of the Sample classified by Gender and Age Group

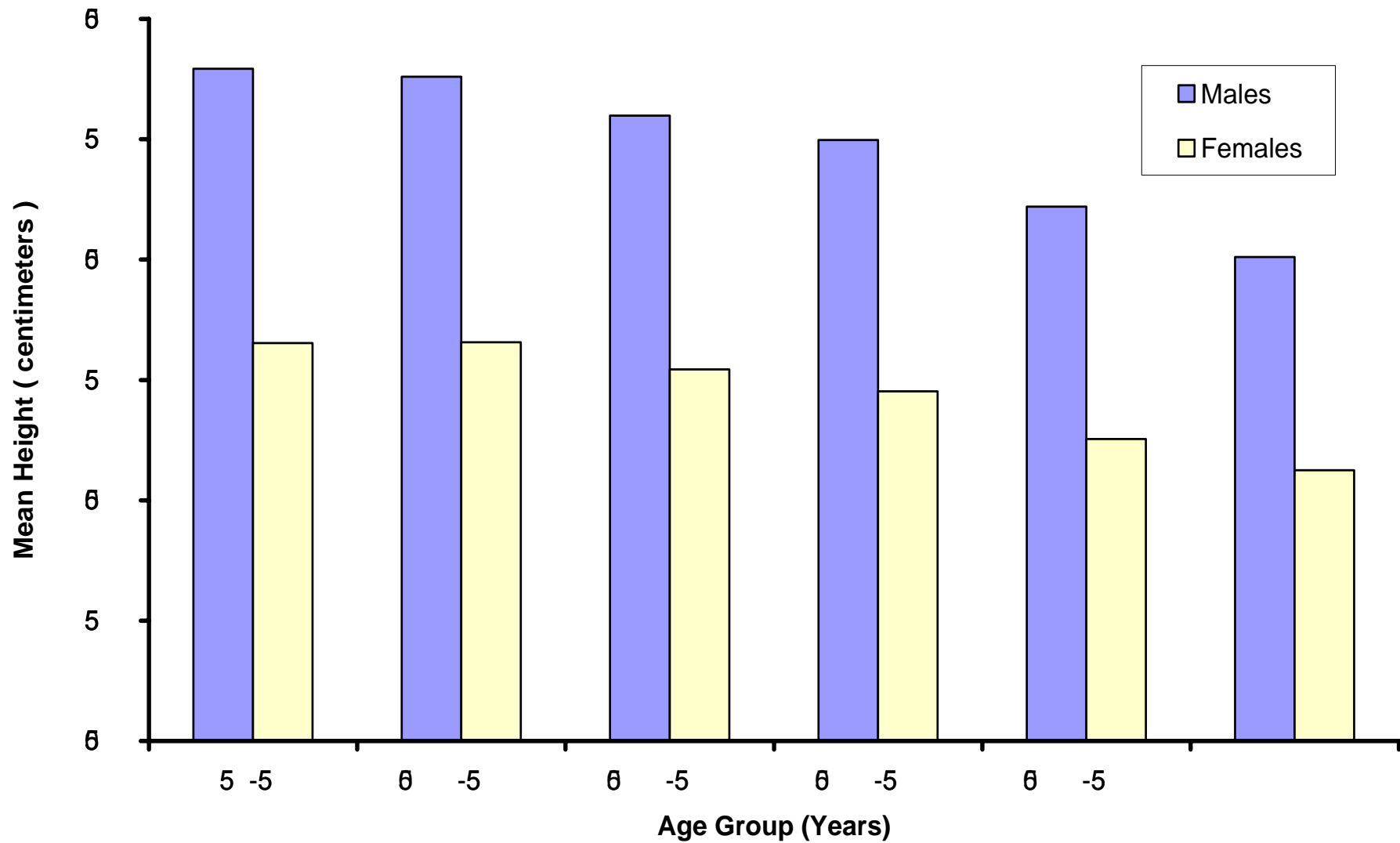


Fig. 5 Mean Height of the Sample classified by Gender and Age Group

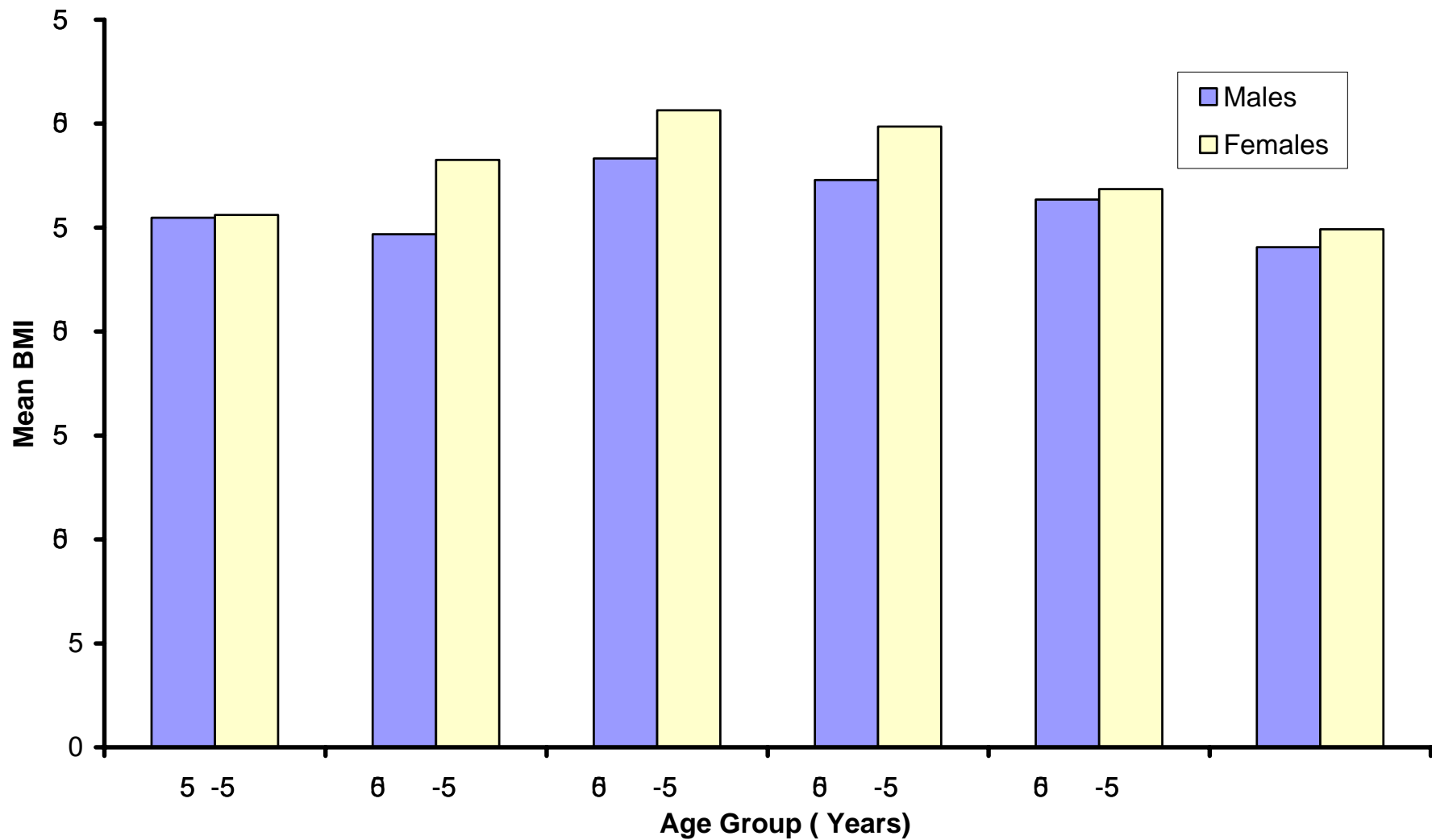


Fig.5 Mean BMI of the Sample Classified by Gender and Age Group

Table 7 . Percentage Distribution of the Sample According to Body Mass Index Classification based on Age and Sex

Age Group(years)	BMI Classification (%)				
	No.	Underweight	Normal	Overweight	Obese
Males					
19-29	212	1.1	8.5	6.6	2.8
30-39	221	0.4	6	6.8	6.5
40-49	173	0.2	2.9	6.9	5.4
50-59	177	0.4	5.2	6.2	4
60-69	197	1	6.4	6.8	3.4
70+	140	1.2	6.8	3.4	1.2
Total	1120.0	4.3	35.8	36.7	23.3
Females					
19-29	203	1.4	7.9	4.6	3.4
30-39	217	0.2	5.8	5.9	6.4
40-49	214	0.4	3.3	4.6	9.8
50-59	200	0.7	3.6	5	7.6
60-69	190	1.2	6.2	4.2	4.5
70+	157	2	5	4	2.4
Total	1181.0	5.9	31.8	28.3	34.1

Fig 10. Percentage Distribution of Underweight and Obesity of the sample by Age and Sex

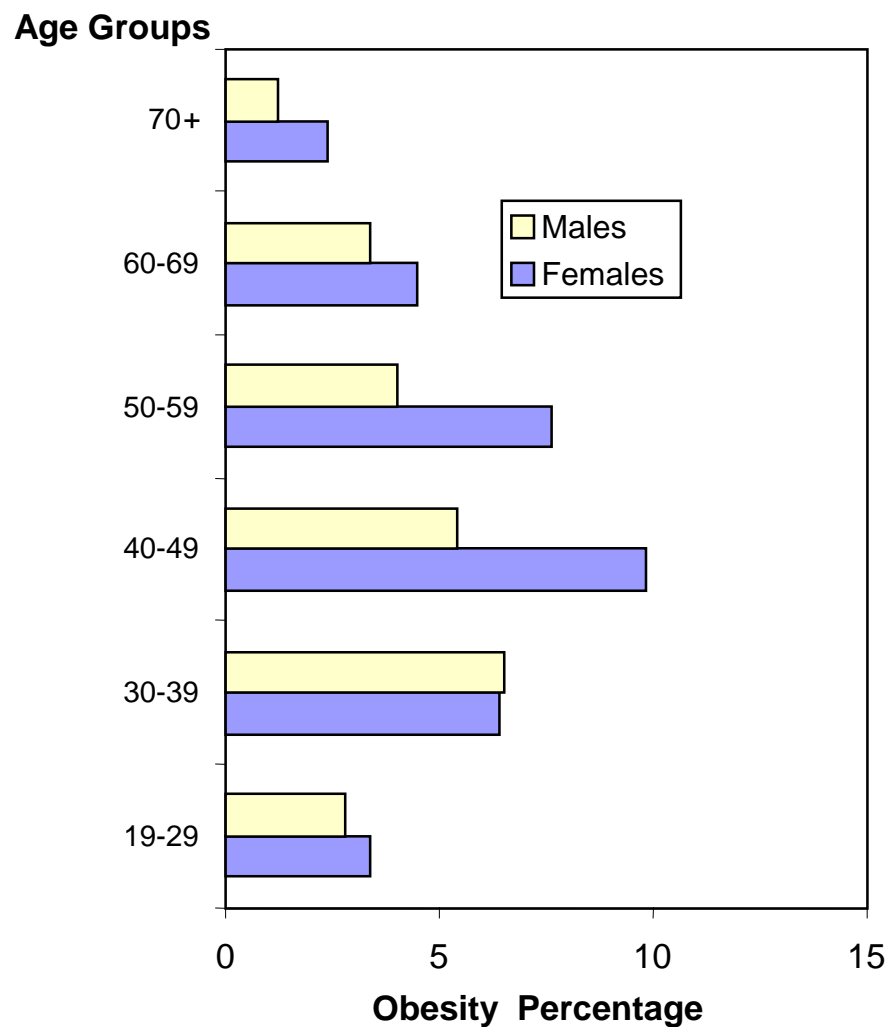
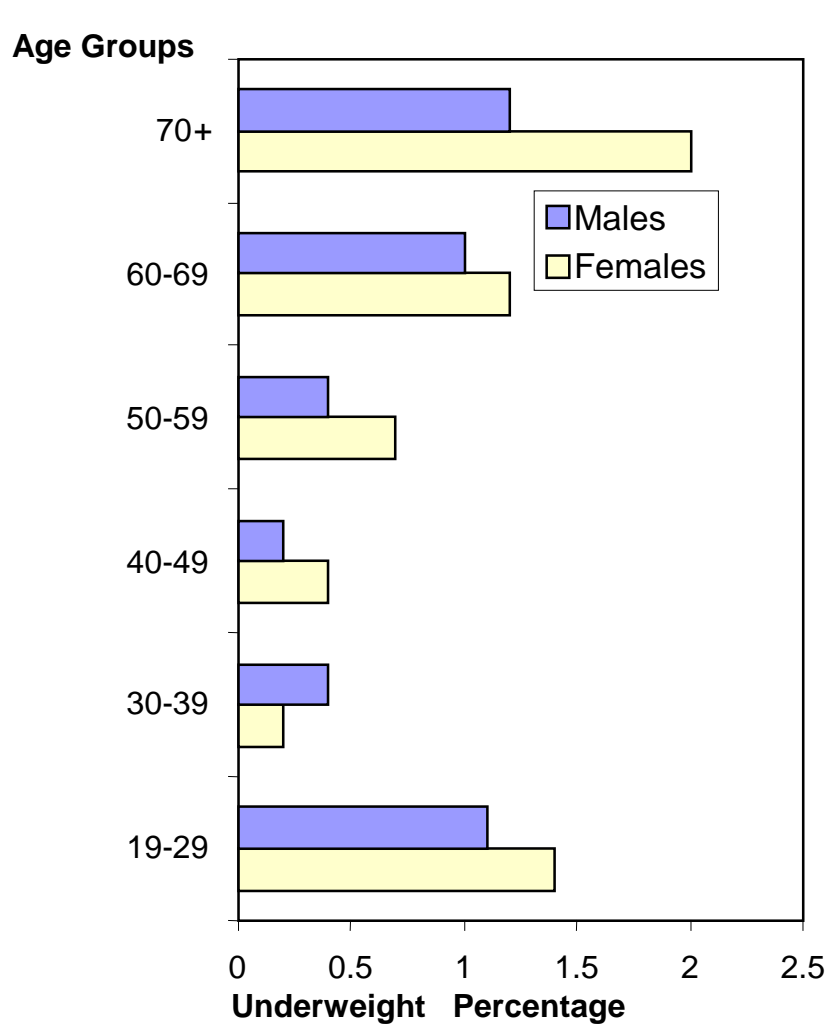


Table 8. BMI Percentage of the Studied Sample by Geographic Location

Place of Residence	Under Wight		Normal		Over Weight		Obese	
	Males	Females	Males	Females	Males	Females	Males	Females
1 - Hidd	0.2	0.1	1.1	0.7	0.9	0.8	0.9	1.1
2 - Muharraq	1.2	1.2	6.9	5.6	6.1	5.0	4.1	6.5
3 - Manama	0.9	1.1	5.4	5.9	6.3	4.0	2.1	6.4
4 - Jidhafs	0.5	1.3	4.1	3.4	2.9	3.7	1.6	3.8
5 - Northern	0.6	0.5	2.9	1.4	1.2	2.0	0.9	1.7
6 - Sitra	0.4	0.4	3.2	3.6	3.4	2.9	1.7	1.7
7 - Central	0.1	0.3	2.4	3.4	3.8	1.9	1.6	1.9
8 - Isa Town	0.3	0.3	3.8	2.1	3.8	2.5	2.4	4.6
9 - Riffa	0.0	0.3	1.8	1.4	2.6	1.9	3.8	3.6
10- Western	0.1	0.2	2.6	2.3	3.6	1.8	0.9	0.8
12- Hamad Town	0.0	0.2	1.7	1.9	2.2	1.8	3.3	2.1
Total	4.3	5.9	35.9	31.7	36.8	28.3	23.3	34.2

Note : Region No.11 Is Not Populated

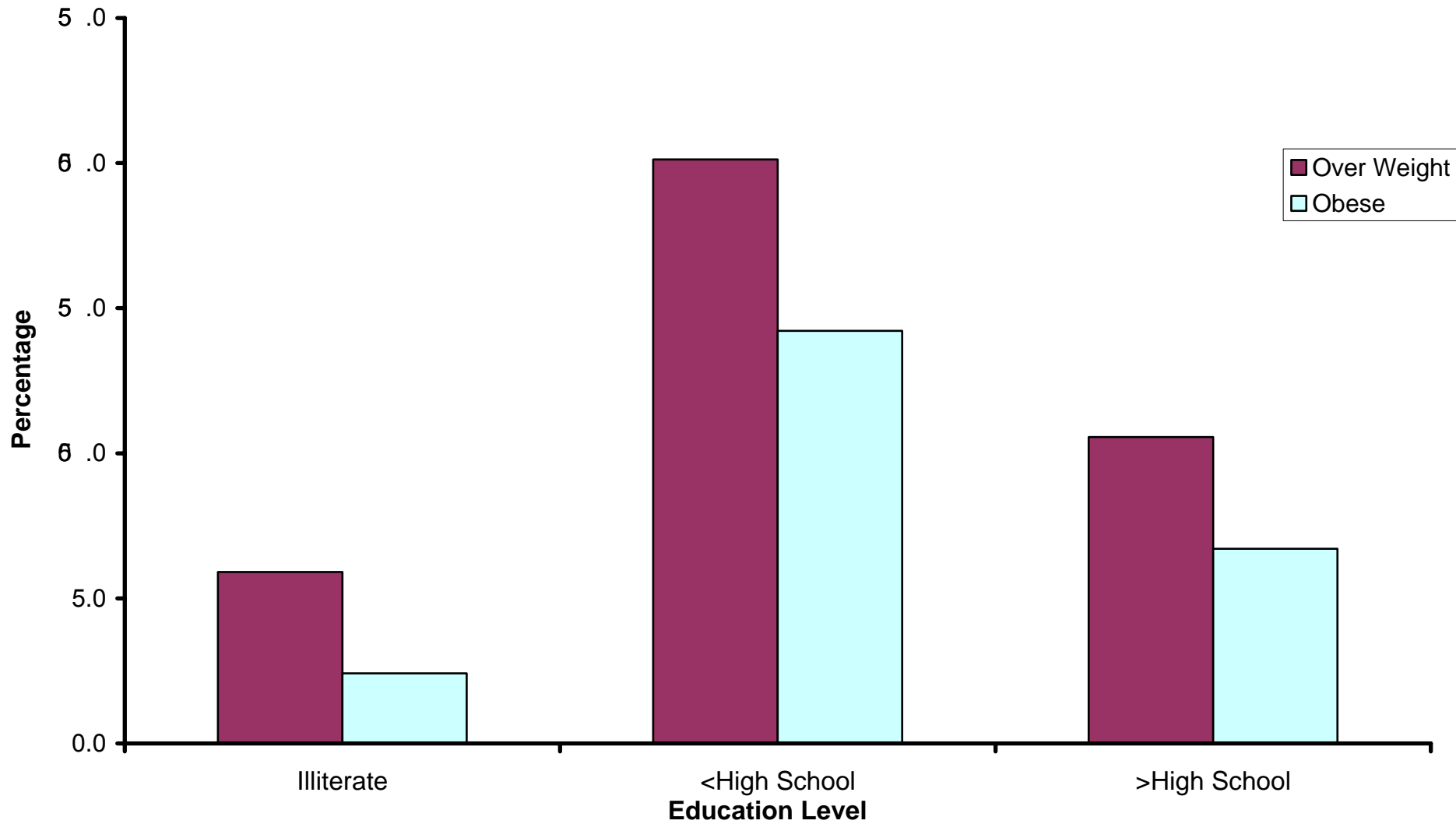


Fig.11 Overweight and Obesity Among Males Classified By Education Level

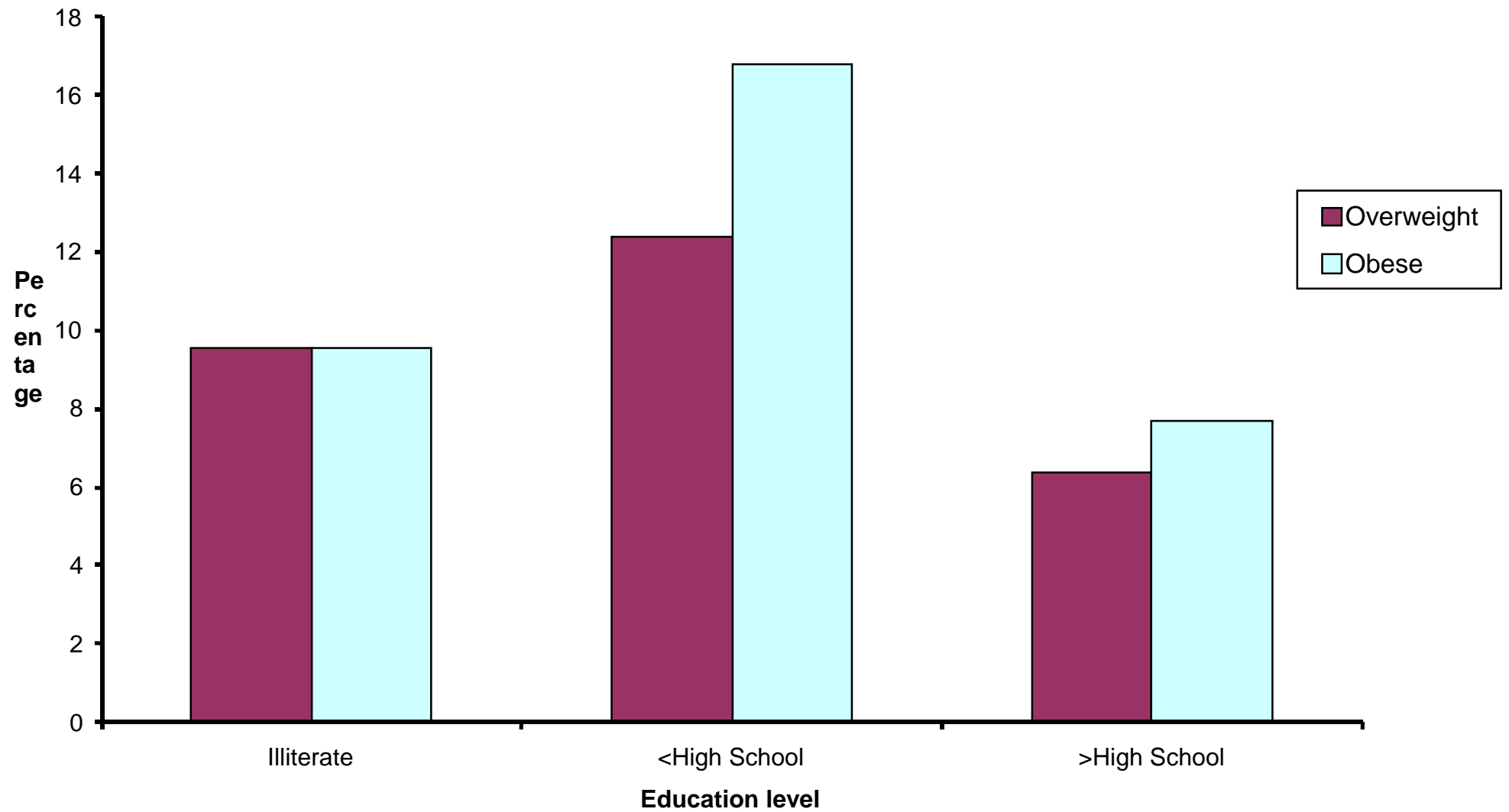


Fig.12 Overweight and Obesity Among Females Classified By Education Level

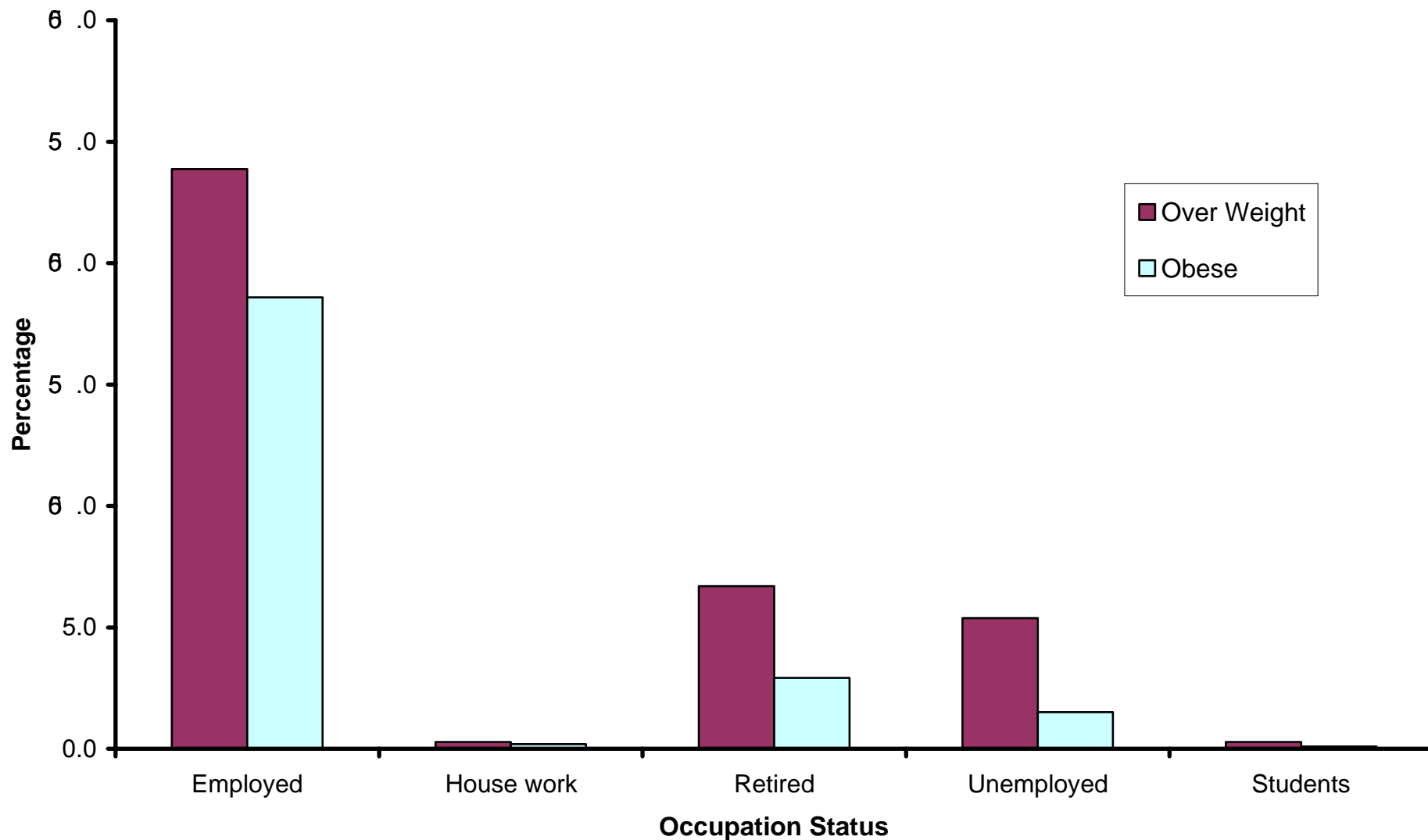


Fig.15 Overweight and Obesity Among Males Classified By Occupation Status

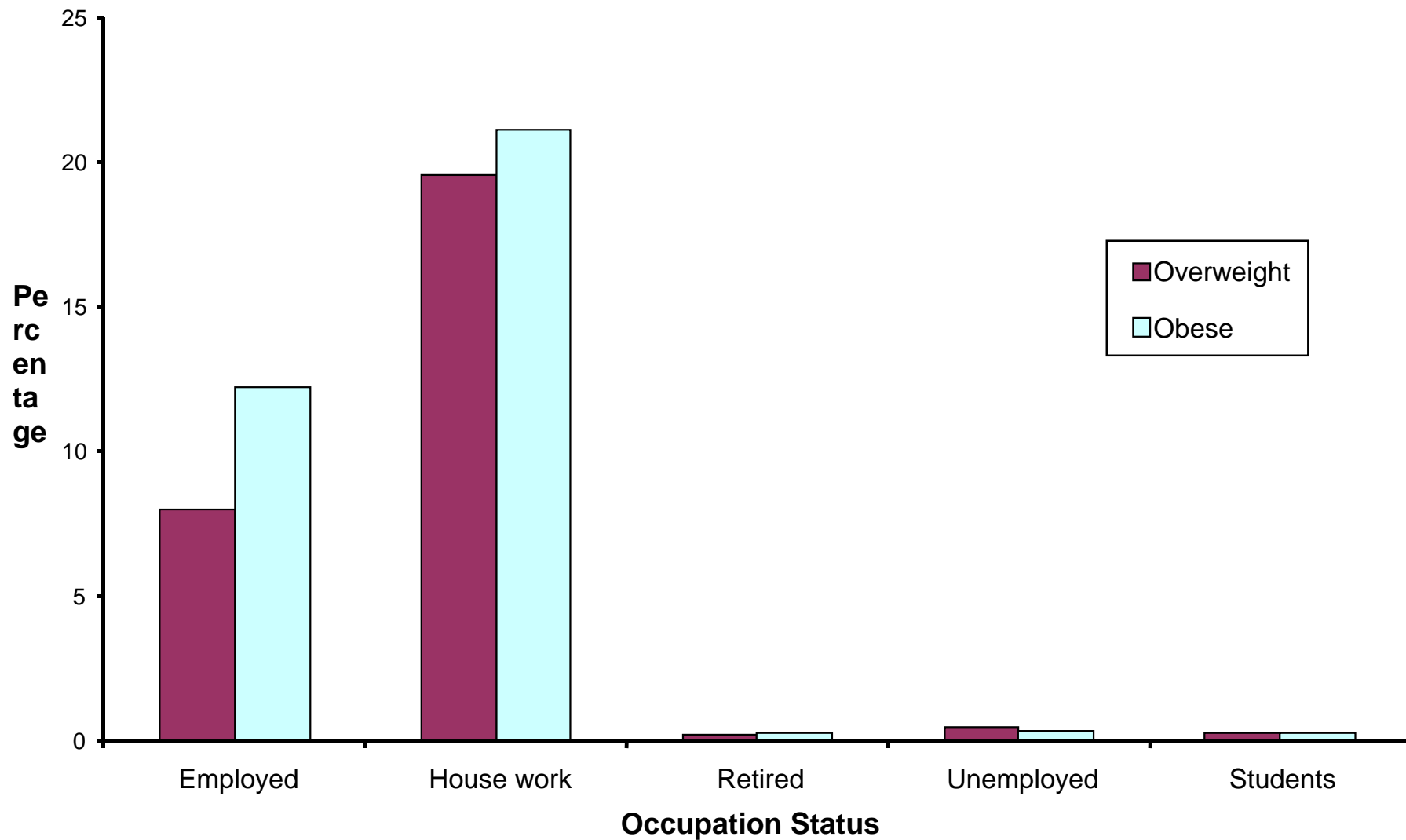


Fig.14 Overweight and Obesity Among Females Classified By Occupation Status

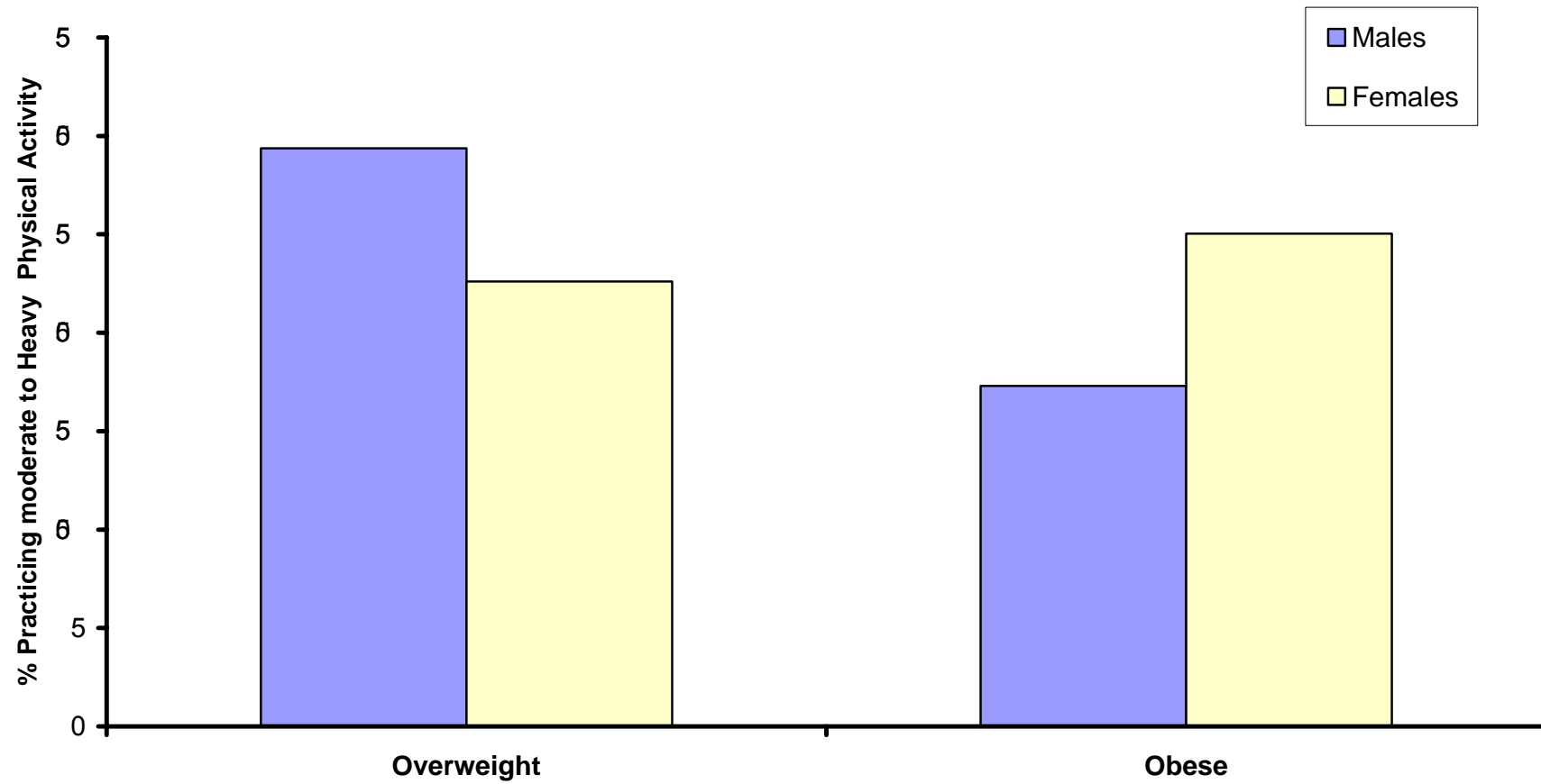


Fig. 15 Physical Activity Behaviour Among Overweight and Obese Males and Females

**Table 9: Frequency of Consumption of Various Food Groups
Among Total Sample**

FOOD GROUPS	5-7 Times/ Week (Almost Daily)		2-4 Times / Week		1 Time / Week		Never	
	No.	%	No.	%	No.	%	No.	%
Fruit and Vegetables								
Fruit	1247	54.2	567	24.6	217	9.4	270	11.7
Fruit Juices	473	20.6	575	25	507	22	746	32.4
Green Vegetables	1222	53.1	606	26.3	235	10.2	238	10.4
Other Vegetables	1060	46.1	632	27.5	333	14.5	276	12
Meat Groups								
Fish	984	42.7	982	42.7	197	8.6	138	6
Chicken	524	22.8	1208	52.5	401	17.4	168	7.3
Meat	172	7.5	897	39	671	29.2	561	24.4
Meat Products	178	7.8	387	16.8	489	21.3	1247	54.2
Eggs	731	31.8	588	25.6	413	17.9	569	24.7
Legumes	206	9	385	16.7	594	25.8	1116	48.6
Nuts	89	3.8	160	7	294	12.8	1758	76.4
Milk Group								
Full Fat Milk	1529	66.4	175	7.6	95	4.1	502	21.8
Low Fat Milk	316	13.7	130	5.6	182	7.9	1673	72.7
Milk Products	1156	50.2	540	23.5	274	11.9	331	14.5
Grains and Cereals								
White Bread	1939	84.3	170	7.4	77	3.3	115	5
Whole Bread	177	7.7	120	5.2	224	9.7	1780	77.3
Cereals	94	4.1	194	8.4	290	12.6	1123	74.9
Pasta	124	5.4	358	15.6	647	28.1	1172	51.0
Grains	1646	71.5	179	7.8	144	6.3	332	14.5
Snacks								
Snack Foods	252	10.9	345	15	427	18.6	1277	55.5
Cakes & Pastries	162	7.1	310	13.5	531	23.1	1298	56.4
Soft drinks	1214	52.8	358	15.6	209	9.1	530	22.6
Fruit drinks	488	21.2	545	23.7	538	23.4	730	31.7
Coffee / Tea	1692	73.5	135	5.9	111	4.8	363	15.8

**Table 10a. Frequency of Consumption of Various Food Groups
Among Males Sample**

Food Groups	5-7 Times/Week (Almost Daily)		2-4 Times/Week		1 Time/Week		Never	
	No	%	No	%	No	%	No	%
Fruits and Vegetables								
Fresh Fruit	618	55.2	267	23.8	105	9.4	130	11.6
Fruit Juices	247	22.1	293	26.2	223	19.9	357	31.9
Green Vegetables	640	57.1	273	24.4	102	9.1	105	9.4
Other Vegetables	547	48.8	304	27.1	144	12.9	125	11.2
Meat Group								
Fish	497	44.4	480	42.9	85	7.6	58	5.2
Chicken	241	21.5	628	56.1	187	16.7	64	5.7
Meat	71	6.3	451	40.3	335	29.9	263	23.5
Meat Products	90	8.0	197	17.6	239	21.3	594	53.0
Eggs	396	35.4	285	25.4	175	15.6	264	23.6
Legumes	90	8.0	190	17.0	313	27.9	527	47.1
Nuts	57	5.1	73	6.5	142	12.7	848	75.7
Milk Group								
Full Fat Milk	756	67.5	71	6.3	44.0	3.9	249	22.2
Low Fat Milk	152	13.6	57	5.1	82.0	7.3	829	74.0
Milk Products	589	52.6	255	22.8	128.0	11.4	148	13.2
Cereal and Grains								
White Bread	993	88.7	56	5.0	23	2.1	48	4.3
Whole Meal Bread	89	7.9	32	2.9	113	10.1	886	79.1
Cereals	38	3.4	63	5.6	117	10.4	902	80.5
Pasta	60	5.4	141	12.6	298	26.6	621	55.4
Grains	874	78.0	68	6.1	44	3.9	134	12.0
Snacks								
Snack Foods	112	10.0	151	13.5	191	17.1	666	59.5
Cakes & Pastries	71	6.3	134	12.0	255	22.8	660	58.9
Soft Drink	696	62.1	142	12.7	89	7.9	193	17.2
Fruit Drinks	263	23.5	260	23.2	242	21.6	355	31.7
Coffee/Tee	895	79.9	56	5.0	45	4.0	124	11.1

**Table 10b. Frequency of Consumption of Various Food Groups
Among Females Sample**

Food Groups	5-7 Times/Week (Almost Daily)		2-4 Times/Week		1 Time/Week		Never	
	No	%	No	%	No	%	No	%
Fruits and Vegetables								
Fresh Fruit	629	53.3	300	25.4	112	9.5	140	11.9
Fruit Juices	226	19.1	282	23.9	284	24.0	389	32.9
Green Vegetables	582	49.3	333	28.2	133	11.3	133	11.3
Other Vegetables	513	43.4	328	27.8	189	16.0	151	12.8
Meat Group								
Fish	487	41.2	502	42.5	112	9.5	80	6.8
Chicken	283	24.0	580	49.1	214	18.1	104	8.8
Meat	101	8.6	446	37.8	336	28.5	298	25.2
Meat Products	88	7.5	190	16.1	250	21.2	653	55.3
Eggs	335	28.4	303	25.7	238	20.2	305	25.8
Legumes	116	9.8	195	16.5	281	23.8	589	49.9
Nuts	32	2.7	87	7.4	152	12.9	910	77.1
Milk Group								
Full Fat Milk	773	65.5	104	8.8	51	4.3	253	21.4
Low Fat Milk	164	13.9	73	6.2	100	8.5	844	71.5
Milk Products	567	48.0	285	24.1	146	12.4	183	15.5
Cereal and Grains								
White Bread	946	80.1	114	9.7	54	4.6	67	5.7
Whole Meal Bread	88	7.5	88	7.5	111	9.4	894	75.7
Cereals	56	4.7	131	11.1	173	14.6	821	69.5
Pasta	64	5.4	217	18.4	349	29.6	551	46.7
Grains	772	65.4	111	9.4	100	8.5	198	16.8
Snacks								
Snack Foods	140	11.9	194	16.4	236	20.0	611	51.7
Cakes & Pastries	91	7.7	176	14.9	276	23.4	638	54.0
Soft Drink	518	43.9	216	18.3	120	10.2	327	27.7
Fruit Drinks	225	19.1	285	24.1	296	25.1	375	31.8
Coffee/Tee	797	67.5	79	6.7	66	5.6	239	20.2

**Table 11. Daily Energy Intake of the Sample Compared to UK* Population
According to Age and Sex Distribution**

Age Group (Years)	Males (kcal/d)		Females (kcal/d)	
	Mean Intake (SE)	% Reference	Mean Intake (SE)	% Reference
19-49	2114.3 (62.2)	82.9	1574.2 (38.7)	81.1
50-59	1997.4 (52.9)	78.3	1374.2 (33.8)	72.3
60+	1655.0 (43.6)	72.9	1248.2 (35.8)	66.7
Total Average	1815.3 (49.20)	78.0	1338.6 (35.8)	73.4

* Daily Energy Intake of the Sample was compared to Estimated Average Requirements (EARs) For Energy for the United Kingdom (22).

Table 12: Daily Micronutrients Intakes for the sample Compared to Reference* By Age and Sex

Nutrients	MALES				Females			
	19 – 50 years (625)		50+ years (495)		19 – 50 years (655)		50+ years (526)	
	Mean	% RNI	Mean	% RNI	Mean	% RNI	Mean	% RNI
Protein (g)	132.5	238.7	84.9	182.6	84.7	188.2	60.8	130.7
Carbohydrates	303.8		263.7		228.3		192.0	
Fat	64.9		49.6		51.8		37.4	
B1 (Thiamin)	3.3	366.7	4.3	482.2	3.5	437.5	2.0	250
B2 (Riboflavin)	2.2	169.2	2.1	161.5	1.6	145.5	1.3	118.2
B6	1.3	92.9	1.2	85.7	1.0	83.3	0.8	66.7
B12	9	600	8.6	573.3	5.6	373.3	5.5	366.7
Folate	220.4	110.2	188.1	94.1	161.5	80.8	121.8	60.9
Vitamin C	111.6	279	84	210	88	220	65	162.5
Vitamin A	888.1	126.9	580.6	82.9	637.1	106.2	443.6	73.9
Calcium	588.6	84.1	587.6	83.9	497.6	71.1	488.4	69.8
Phosphorus	978	177.8	945	171.8	752.8	136.7	709.1	128.9
Magnesium	165.1	55	149.4	49.8	132.2	44.1	99.5	36.9
Sodium	5300.5	331.3	5185.9	324.1	3729.1	233.1	3384.4	211.5
Potassium	2672.7	76.4	2298	65.7	2076.7	59.3	1525.2	43.6
Iron	18.4	211.5	14.8	170.1	12.4	83.8	10.2	117.2
Zinc	9.6	101.1	6.9	72.6	5.9	84.3	4.3	61.4
Copper	0.7	58.3	0.56	46.7	0.45	37.5	0.34	28.3

* Daily Nutrient Intake of the sample compared to the Reference Nutrient Intakes (RNIs) for the United Kingdom (22)

Table 13. Percentage of Kilo Calories Produced from Proteins, Carbohydrates, and Fats Sources *			
Age Group(Years)	% of Kcal Sources		
	Protein	Carbohydrates	Total Fat
Males			
19 - 50	20.78	47.66	22.9
50 +	14.51	45.18	19.12
Females			
19 - 50	17.46	47.07	24.03
50 +	12.95	40.91	17.93

* WHO Recommended Percentages of Kcal from Different Types of Nutrients are :

Protein (15 % of Kcal)

Carbohydrate (50 -55 % of Kcal)

Fat (30 % of Kcal)

**Table 14 . Mean Values of Some Types of Nutrients , Per 1000 kcal ,
Taken by the Sample Compared to Single - Value Nutrient Density
of American Recommendations * (1 Year and older)**

Nutrient	American Recommended Amounts * (g)	Mean Amount Taken By Sample (g)	% of the American Recommendation
carbohydrate	138	148.7	107.8
Total Fat	33	31.2	94.5
Saturated fat	11	2.7	24.5
Polyunsaturated , Fat	11	0.6	5.5
Monounsaturat, Fat	11	0.01	0.1
Cholesterol	100	84.7	84.7
Dietary Fiber	10	4.7	47

* Recommendations were derived from the 1989 revision of the US Recommended Dietary Allowances and " Prudent Diet " recommendations (24)

Table 15. Distribution of Anemia * Among the Sample According to Age and Sex.

Age Groups(Years)	Males				Females			
	Mean(SD)	No.	%**	%***	Mean(SD)	No.	%**	%***
19-29	11.7 (0.8)	40	17.1	3.6	10.7 (1.0)	91	20.6	7.7
30-39	11.7 (0.7)	38	16.2	3.4	10.7 (0.9)	90	20.4	7.6
40-49	11.7 (0.8)	28	12.0	2.5	10.7 (0.9)	81	18.4	6.9
50-59	11.8 (0.8)	49	20.9	4.4	10.7 (1.1)	58	13.2	4.9
60-69	11.2 (1.5)	48	20.5	4.3	10.8 (1.0)	64	14.5	5.4
70+	11.6 (1.1)	31	13.2	2.8	10.8 (0.8)	57	12.9	4.8
Total	11.6 (1.0)	234	100.0	20.9	10.7 (0.9)	441	100.0	37.3

* Anemia is Defined according to WHO (19) as
Follows :

Males Hb < 13 (g/dl)

Females Hb < 12 (g/dl)

** Percentage is Taken From Anemic Groups Only (Males = 234 , Females = 441)

*** Percentage is Taken From the Total Sample (Males = 1120 , Females = 1181)

Table 16. Low Energy Reporters classified by age and BMI

BMI Classification	Age in years, No (% of Total)						
	19-29	30-39	40-49	50 – 59	60-69	70+	Total
Underweight	6 (0.5)	2 (0.2)	2 (0.2)	6 (0.5)	8 (0.6)	19(1.5)	43 (3.5)
Normal	65 (5.3)	49 (4.0)	37 (3.0)	57 (4.6)	72 (5.8)	61 (5.0)	341 (27.7)
Overweight	73 (5.9)	75 (6.1)	78 (6.3)	75 (6.1)	65 (5.3)	51 (4.1)	417 (33.8)
Obese	48 (3.9)	86 (7.0)	118 (9.6)	95 (7.7)	62 (5.0)	22 (1.8)	431 (35.0)
Total	192 (15.6)	212 (17.2)	235 (19.1)	233 (18.9)	207 (16.8)	153 (12.4)	1232 (100)

Fig. 16 Mean Energy Intake by Income

