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COLLEGE OF HEALTH SCIENCES

SCHOOL OF PUBLIC HEALTH

ASSESSMENT OF OVERWEIGHT, OBESITY AND HYPERTENSION AMONG SHIFT AND DAY TIME FACTORY WORKERS IN WONJI SHOA SUGAR FACTORY, ETHIOPIA

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ASSESSMENT OF OVERWEIGHT, OBESITY AND HYPERTENSION AMONG SHIFT AND DAY TIME FACTORY WORKERS IN WONJI SHOA SUGAR FACTORY, ETHIOPIA

A comparative cross sectional study

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LIST OF ACRONYMS

AAU	-	Addis Ababa University
BMI	-	Body Mass Index
CI	-	Confidence Interval
Cm	-	Centimeter
CHD	-	Coronary Heart Disease
CVD	-	Cardio Vascular Disease
Kg	-	Kilogram
NAR	-	Nutrient Adequacy Ratio
NCHS	-	National Center for Health Statistics
NGO	-	Non- Governmental Organizations
OR	-	Odds Ratio
PI	-	Principal Investigator
SPSS	-	Statistical Package for Social Sciences
SRS	-	Simple Random Sampling
WHR	-	Waist-to-Hip Ratio
WHO	-	World Health Organization

ABSTRACT

Background: Stable circadian rhythm is important for proper functioning of the physiological activities of the body. Shift work, including night work, has been hypothesized to increase the risk of chronic diseases, including cancer, cardiovascular disease (CVD), metabolic syndrome and diabetes. Recent reviews of evidence relating to these relationships support the hypothesis. However, few studies have attempted to establish the role of shift-work in determining chronic diseases risk factors in a developing country setting. Therefore, the present study attempted to address this knowledge gap by assessing the magnitude and determinant factors of chronic disease risk factors among shift workers and day workers.

Objective: To determine and compare the levels of risk factors for selected chronic non communicable diseases (obesity and hypertension) among shift and day time workers in Wonji Shoa sugar factory workers, Ethiopia.

Method: A comparative cross sectional study was conducted from October, 2011 – December, 2011 in Wonji Shoa sugary factory, East shoa, Oromia Region. The study participants were 836 factory workers (418 shift workers and 418 day time workers) who have worked at least for five years. Data was collected using a pretested structured questionnaire, and weight, height, waist circumference and blood pressure was measured using standardized weighing scale, measuring board and digital sphygmomanometer respectively. Data was entered using Epi- info version 3.4 and analyzed by SPSS version 16. A descriptive statistics, bivarate and multivariate analysis was done as appropriate.

Result: Overall the prevalence overweight/obesity among the factory workers was 34.1% *(95% CI=30.9%, 37.3%)*; 15.7% among shift workers versus 18.4% among daytime workers. Shift workers were 39% more likely to be overweight/obese compared with day time workers although the difference was not statistically significant *[AOR (95% CI) = 1.39 (0.93, 2.09)]*. Overall the prevalence of obesity among the factory workers was 4.2% (3.1% among shift workers versus 5.3% among daytime workers; *(95% CI=2.8%, 5.6%).* But, the difference was not statistically significant *[AOR (95% CI) = 1.0 (0.44, 2.26)]*.

The prevalence of hypertension was 36.4% (*95% CI=33.1%, 39.7%), 21.3%* among shift workers versus 15.1% among daytime workers*; s*hift workers being significantly more likely to be hypertensive compared with their day time counterparts *[AOR (95% CI) = 1.48 (1.02, 2.14)]*. Shift workers were also significantly more likely to be smokers *(13.1% versus 6.5%; P-value< 0.05)*. Factors associated with overweight/obesity include female sex *(AOR ;95% CI = 1.97 (1.26, 3.08)*, older age (AOR; 95% CI=3.15(1.23,8.07), higher educational status (AOR; 95% CI=1.53(1.003,2.32), higher income quintile (AOR; 95% CI=7.28(3.81,13.89), more working experience in the factory (COR; 95% CI=1.59(1.00,2.51) and non smoking habits (AOR; 95% CI=2.25(1.15,4.39).

In contrast, the condition of being a shift worker was associated with hypertension (AOR; 95%CI=1.48(1.02, 2.14) along with older age (AOR; 95% CI=3.99(1.65, 9.67), higher income quintile (AOR; 95% CI=3.24(1.78, 5.89), and family history of hypertension (AOR; 95% CI=2.24(1.54, 3.26).

Conclusions and Recommendations: The present study has identified working in a shift is associated with higher odds of having hypertension and overweight/obesity though the later was not statistically significant regardless of difference in age, gender, physical activity and dietary habits. Shift workers were also more likely to be smokers, which is an important risk factor for cardiovascular diseases. Therefore, efficient health screening and regular checkups combined with support in controlling unhealthy lifestyle factors has the potential to be of considerable benefit in maintaining the health of shift workers.

1. INTRODUCTION

1.1 Background

Shift work refers to work patterns that extend beyond the conventional 8-hour work day and that potentially disrupt workers' normal biological and/or social diurnal rhythms. The varieties of shift work include permanently displaced work hours (including night work), rotating shift work, and unscheduled work hour [(1)]. Of these, rotating night shifts are particularly disruptive for sleep, wakefulness, eating patterns, and social activities [(2)].Rotating night shifts also are associated with reduced job-related performance and higher levels of perceived stress [(3, 4)].

Nowadays the number of shift workers has increased due to technological development. Shift work is extremely frequent in several services and industries, in order to meet the needs for flexibility of the workforce, necessary to optimize the productivity and the business competitiveness in developed countries, where the proportion of shift workers is estimated to represent >20% of the entire working population [(1)].

Shift work is associated with several health problems, possibly due to an impairment of biological rhythms. In particular, an increased risk of coronary heart disease (CHD) has been reported in several studies performed in shift workers, with a direct association between relative risk for CHD and time of exposure to shift work [(5, 6)].

Additionally, several studies have reported a higher prevalence of coronary risk factors among rotating shift workers, including increased cigarette consumption, higher blood pressure, and increased serum cholesterol, glucose, and uric acid levels and urinary adrenaline excretion [(7)].

The biological mechanisms that show how shift work acts to induce such disorders in workers are relatively unknown. Therefore, further insight is needed to elucidate the effect of shift work on cardiovascular risk.

1.2 statement of the problem

Obesity is a well known independent cardiovascular risk factor [8] and, interestingly, it has been shown to be more prevalent among shift workers;[9-12] similarly, a more marked weight gain has been reported in shift workers [12]. Moreover, abdominal fat accumulation is a cardiovascular risk factor stronger than obesity itself [13]. And it is noteworthy that shift workers have been shown to have higher waist-to-hip ratio (WHR) than day workers, independently of body mass index (BMI) [14, 15].

Information both on the percentage and trends of shift workers at the national level is missing in country. To the best of my knowledge, there are no research reports on health problems of shift workers in the country. There is also little information regarding cardiovascular risk factors in the working class in the country level. Therefore, the primary aim of this paper was to compare the effect of shift working on BMI, smoking, alcohol consumption and blood pressure in Wonji Shoa sugar factory workers. Obesity and hypertension are among the less well known and studied health problems associated with shift work, especially in our country. Therefore, this information will be utilized by policy makers, health managers and other non-governmental organization or as a baseline for future research activities.

2. LITERATURE REVIEW

Shift work is now common in society and is not restricted to heavy industry or emergency services, but is increasingly found amongst the growing number of service industries. Participation in shift work is associated with increased body mass index, prevalence of obesity and other health problems. The behavioral and biological disturbances that occur during shift work and their impact on leisure-time physical activity and energy balance contribute for many health problems in the workers [15-17].

2.1 Shift work and abdominal obesity

A study which compared fasting blood sugar level, HDL-cholesterol, triglycerides, blood pressure, and waist circumference between shift and day time workers in Italy showed that rotating shift nurses had greater waist circumference ($p<0.001$), higher serum triglycerides ($p< 0.001$) and fasting plasma glucose ($p< 0.05$), and lower concentrations of HDL cholesterol ($p<0.01$). No significant association between metabolic syndrome and shift work was found. Abdominal obesity and high serum triglycerides were significantly associated with shift work after adjusting for age, sex, smoking, alcohol consumption and job seniority. [14].

A cross-sectional study among male blue collar, personal computer and printer manufacturing company workers showed that 3-shift and 2-shift workers(rotating every eight hour) had greater values of abdominal to hip girth ratio (AHR) and sub scapular skin fold thickness than day workers, with statistically significant differences in AHR between shift and day workers ($p<0.05$). There were no statistically significant differences in BMI. About 69% of shift workers did not exercise at all, while 50% of the day workers did ($p<0.05$). More than 70% of all groups of workers smoked everyday and the differences among the three groups were not statistically

significant. The highest alcohol consumption every day was in 3-shift workers (54%). Frequency of no drinking habits also tended to be greater in the 3-shift workers, but the differences were not statistically significant [(15)].

2.2 Shift work and unhealthy behaviors

One cross-sectional study conducted among Female nurses from Västerbotten intervention program in Sweden comparing those working shifts and permanent day worker showed that shift workers were more often smokers than day time workers($p=0.027$). There was a significantly higher tobacco consumption in shift workers ($p=0.027$). The prevalence of heavy drinkers were higher in shift workers than in day workers, but the difference did not reach statistical significance. Shift workers were more likely to be overweight than day workers and the difference between these two groups increased with age. Sedentary lifestyle was not significantly different among shift workers compared to day workers [(16)]. Another similar study which measured the prevalence of tobacco use and passive smoking in Sweden indicated that smoking was significantly associated with shift work [(18)].

A study conducted in Finnish Hospital Personnel' project showed that there was a significantly higher tobacco consumption among shift workers ($p=0.027$). The prevalence of heavy drinkers was also higher in shift workers than in day workers, though it was not statistical significance. Shift workers were more likely to be overweight than day workers which was more pronounced with increasing age. Sedentary lifestyle was not significantly different between the two groups. [(19)].

2.3 Shift work and hypertension

Shift work associated with various health problems and there is concern that shift workers are at higher risk to develop hypertension. A cross-sectional study which was conducted to compare the prevalence of hypertension among shift and day time worker showed that to the prevalence of hypertension was significantly higher among shift workers (22.4%) compared to day workers (4.2%), with p-value of 0.001. Shift work was significantly associated with hypertension ([17].

2.4 Shift work and obesity

One cross-sectional study conducted in Taiwan to investigate the associations of obesity and metabolic syndrome (MS) components among women working in day and shift showed that women working in the clean room on fixed 12 hours night shifts had significantly elevated odds ratios for obesity, central obesity, and high blood pressure compared to female office workers; these results persisted after adjusting for age, smoking, drinking, education, and duration of work [11].

Another cross sectional study which is conducted in Italy showed that obesity was more prevalent in shift workers than in day workers ($p<0.05$), whereas body fat distribution was not different between the two groups. Shift workers were more frequently smokers than day workers even though this difference did not reach statistical significance ($p=0.058$). There was a significant relationship between shift work and BMI, even after taking into account fasting insulin levels ($p<0.05$) [12].

A study which is conducted in Malaysia to examine the socio-demographic and lifestyle factors that are associated with being overweight also showed that working in rotating shifts was significantly associated with being overweight ($p<0.001$). Shift workers including nights faced significantly higher odds of being overweight even after adjusting for age and other variables [10]. A longitudinal observational study conducted in a nurses' cohort in France showed that Prevalence of being overweight was associated with exposure to night work. After adjustment for confounding variables more nurses on night work exhibited excessive weight gains than nurses on day work[8].

2.5 Shift work and diet

A cohort study which is conducted in Brazil to investigate the influence of shift work on energy and nutrient intake showed that there is no significant association between shifts work and protein, carbohydrate and fat calories intake. However, shifts were found to significantly influence intake of starches, alcoholic drinks, and sweets. In different periods of the day, food and nutrient intake were also affected by shifts. The total number of eating events per day was higher for night shift workers compared to morning shift workers and afternoon shift workers ($p=0.004$) [20].

Another cross sectional study which is conducted in West Bengal to assess the effect of rapidly rotating shift work on food intake showed that the number of snacks, full meals, appetite and eating habit satisfaction of the rotating shift and general duty nurses. In night shift nurses, the number of full meals were significantly low ($p<0.0005$) compared to morning and afternoon shift and off day. Similarly, the appetite and eating habit satisfaction were significantly lower $p<0.0005$) and the number of snacks were significantly higher ($p<0.0005$) when nurses working

in night shift compared to other shift. Comparison between the two groups, the number of full meals, appetite and eating habit satisfaction were significantly lower ($p<0.0005$) and the number of snacks were significantly higher ($p<0.0005$) in night shift of rotating shift nurses than the working day and off day of the general duty nurses [21].

This study also showed that significant difference in the amount of nutrient intake. The amount of nutrient intake also significantly varies in between morning shift, afternoon shift and off days. The carbohydrate, protein and fat intake in night shift and fat intake in morning shift were significantly lower ($p<0.0005$) than the general working day where there is no significant difference between the general working day and afternoon shift and between general working day and shift off day [21].

A prospective cohort study conducted in female workers in Japan showed that mean nutrient adequacy ratio on working days was higher in daytime workers and the lowest in late shift workers. On the off day, only carbohydrate intake was significantly larger in daytime workers than in late- shift workers ($p<0.017$). The percentage of the subjects who took breakfast was the lowest in late shift workers and non meal frequency played a principal role in the low Nutrient Adequacy Ratio of the late shift workers. The results showed that the shift workers, particularly the late-shift workers, consumed smaller amounts of energy and nutrients than the daytime workers[22].

3. OBJECTIVES OF THE STUDY

3.1 General objective

- To assess the prevalence and determinant factors of overweight, obesity and hypertension among shift and day time workers in Wonji Shoa sugar factory, East Shoa, Oromia Region.

3.2 Specific objectives

- To determine and compare the prevalence of overweight, obesity and hypertension among shift and day time workers in Wonji Shoa sugar factory.
- To assess determinant factors of overweight, obesity and hypertension among shift and day time workers in Wonji Shoa sugar factory.

4. METHODS AND MATERIALS

4.1 Study Design

An institution based comparative cross-sectional study was conducted among randomly selected shift and day time workers in Wonji Shoa sugar factory.

4.2 Study Area and period

The study was conducted from October 2011- December 2011 in Wonji Shoa sugar factory, East Shoa, Oromia Regional State, Ethiopia. Wonji Shoa Sugar Factory is one of the oldest agro industries in Ethiopia established by a Dutch private company in 1954GC. It is located in the Central Rift Valley of Awash River Basin, around 112 kilometers Southeast of Addis Ababa. The factory has been engaged in the production of sugar, confectionary and other different sugar byproducts mainly for domestic market. The estate consists of two sugar mills, one confectionary works, one limekiln (an oven that is used for heating limestone to produce quicklime – calcium oxide), 6000 hectares of cane plantations and one hospital. The hospital is intended to serve its employees, their families, surrounding communities and farmer associations on credit. The factory has about 7,105 workers, 3,167 day time workers and 3,938 shift workers. Tef is the staple food in the area. There is also vegetable and fruit plantation following the river basin which is used for local consumption and market.

4.3 Source Population

The source population were all Wonji Shoa sugar factory workers during the study period.

4.4 Study Population

The study population were all current Wonji Shoa sugar factory workers selected at random with the following inclusion and exclusion criteria.

Inclusion Criteria;

- All workers who have worked at least for 5 years in the factory
- Workers who have eight hour shift in a regular manner
- Day time workers who do not have any shift work currently or in the past

Exclusion Criteria;

The following subjects were excluded from the study:-

- Obvious physical deformity and pregnancy
- Out of work during data collection due to annual leave or illness
- Refusal to participate in the study
- known psychiatric patients who are taking medication

4.5 Sample Size Determination

The sample size was calculated using a two-sample proportion formula taking the outcome with obesity/overweight as a key variable

$$n_1 = \frac{\left[Z_{\frac{\alpha}{2}} \sqrt{\left(1+\frac{1}{r}\right) P(1-P)} + Z_{\beta} \sqrt{P_1(1-P_1) + \frac{P_2(1-P_2)}{r}} \right]^2}{(P_1 - P_2)^2}$$

Where $P = (P_1 + r\,P_2)/1+r$

n = required minimum sample size for the two groups ($n_1 + n_2$)

P_1 = Prevalence of obesity/overweight among day workers, 36% from previous studies [9].

P_2 = Prevalence of obesity/overweight among shift workers, 46 % (a 10% difference assumed to signify public health significance for lack of previous studies).

Pooled population, **P= 41%**

$Z\ \alpha/_2$ = 1.96 at 95% level of confidence

Z_β = 0.84 for 80% power of the test

r = 1, Proportion of group 1 to group 2 (shift workers to day workers) is taken as equal 1:1

n_1=398

n_2=398, thus n=796

Adding 5% non-response rate gives the total sample size of **836** that means 418 participants in each group.

4.6 Sampling Procedure

First, the list of the workers was obtained from Wonji Shoa sugar factory personnel Department. Then workers were stratified by their work pattern as shift and day time workers, and Study participants were selected from each group using simple random sampling.

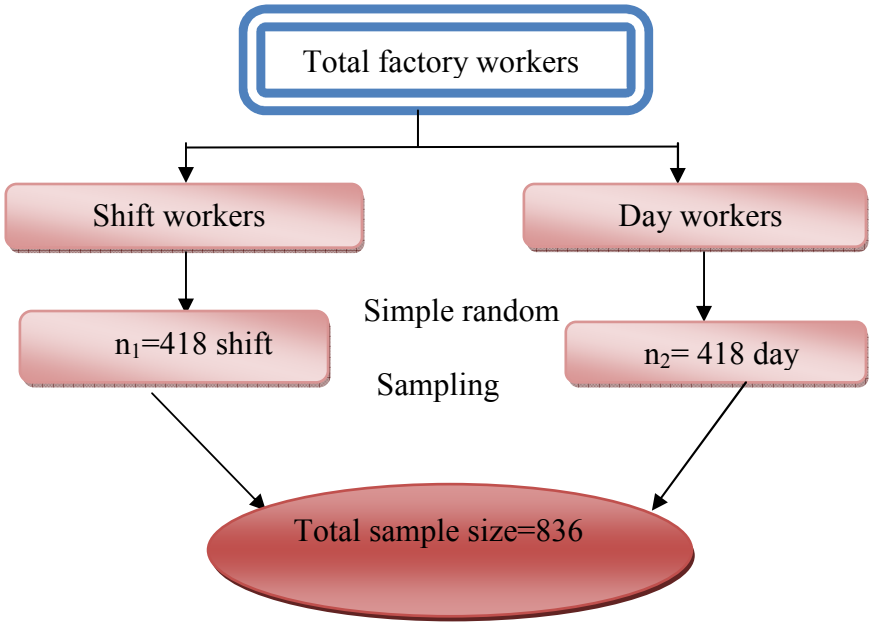

Figure1: Schematic Presentation of the Sampling Procedure

4.7. Study Variables

4.7.1. Dependent Variables

Obesity and overweight (Yes, No)

Hypertension (yes, No)

4.7.2. Independent variables

Sex

Age

Duration of work at the factory

Religion

Marital status

Economic status

Dietary habit

Physical activity

Alcohol consumption

Cigarette Smoking

Shift and Day time working

4.8 Data Collection Procedures

4.8.1 Data Collection Tools

Socio-demographic, dietary intake and physical activity information were collected from all eligible subjects using a pre-tested structured questionnaire by trained nurses under close supervision of the principal investigator. Weight was measured using digital balance with a precision of 100gm calibrated against known weights regularly. Only light clothes were worn by the study participants during measurement of body weight. Height was also measured using measuring board with precision of 10mm without foot wear. Two measurements of height and weight were registered for each participant, and a third measurement was considered when the difference between the two measurements was greater than 10 mm or 100 gm respectively. In the final analyses the average of the two closest measurements was considered.

Waist circumference measurements was performed with a fixed tension tape, at the midpoint between the lower margin of the last palpable rib and the top of the iliac crest [23]. Systolic and diastolic blood pressures were measured twice, using an 8x14 cm cuff of a standard digital sphygmomanometer. The average of the two readings for both systolic and diastolic pressures was recorded.

4.8.2. Data Collectors

Data was collected by 4 nurses who were trained for two days on the data collection instrument and ethical conduct of a study. The principal investigator has participated both in the training and data collection process.

4.8.3. Data Collection Procedure

Data on relevant information and their height, weight, WC, and BP was measured after securing written consent from participants. BP was digitally measured. Two BP measurements were taken from left arm with each subject sitting on a chair with supported arm and 3 minute elapsing between successive measurements after at least five minutes of rest. The measurement was taken early in the morning from 7am- 10 am and in the afternoon after 4pm in a calm environment.

4.8.4. Quality Control

The questionnaire was prepared in English and then translated in to Amharic. Before the actual study begins the questionnaire was tested among factory workers not selected for the study. To improve the quality of the data, the data collectors were closely supervised by the principal investigator; each completed questionnaire was checked to ascertain whether all questions are properly filled or not and necessary correction was made at spot.

4.9 Data processing and management

After the data was collected, it was checked for its completeness and internal consistency. It was then entered, cleaned with Epi-info version 3.5.1. It was stored on hard drive and back up copy was stored in a separate drive. SPSS software version 16 was used for statistical analysis. Descriptive statistics was used to summarize and present the information in the form of mean, median, percentages and tables. Multiple binary logistic regression was used to examine the

association between shift work and overweight/obesity as well as hypertension adjusting for other potential confounders. Both crude and adjusted odds ratio are presented with a 95% confidence interval. A p-value of less than 0.05 was used to define statistical significance.

4.10 Ethical Considerations

Ethical clearance was obtained from the Research Ethics Committee at the school of public health, Addis Ababa University. A formal letter of support was submitted to the factory administration to get permission and facilitate the work. Data was collected with the informed written consent of study participants. Participants were informed about the objectives of the study, how long it takes to fill the questionnaire and the measurements and their right to withdraw from the study if they decide to do so. Questionnaires were anonymous and participants were reassured of the confidentiality of the information they provided. After the measurement of weight and height, the BMI was calculated immediately and they were advised accordingly. Participants with elevated BP were advised by the principal investigator and referred to the hospital for follow up. The explanations were conducted by respondent's native language, Amharic.

4.11 Dissemination of Results

The final report will be submitted to the School of Public Health, Addis Ababa University as partial fulfillment for the degree of Master of Public Health. Effort will also be made to disseminate the results through publications and presentations in scientific conferences.

4.12 Operational Definitions

- **Shift workers:** those who work beyond the conventional 8-hour work day, including permanently displaced work hours (including night work), and rotating shift work.
- **Day time workers:** those who are engaged in the conventional 8-hour working day.
- **BMI classifications:** whose BMI
  - "Normal" - 18.50-24.99,
  - "overweight" -25-29.99 and
  - "obese" - >30 Kg/m^2 [24]
- **Hypertensive:** if SBP ≥140 or DBP ≥90 and/or history of diagnosed hypertension and on treatment [25].
- **Overweight/obesity:** Those who are either of overweight or obese
- **Physical Activity**
  - **High Physical Activity:** The two criteria for classification as 'high' are:

a) Vigorous-intensity activity on at least 3 days achieving a minimum Total physical activity of at least 1500 minutes/week **OR**

b) 7 or more days of any combination of walking, moderate-intensity or vigorous intensity activities achieving a minimum Total physical activity of at least 3000 minutes/week [26].

  - **Moderate Physical Activity:** The pattern of activity to be classified as 'moderate' is either of the following criteria:

a) 3 or more days of vigorous-intensity activity of at least 20 minutes per day **OR**

b) 5 or more days of moderate-intensity activity and/or walking of at least 30 minutes per day **OR**

c) 5 or more days of any combination of walking, moderate-intensity or vigorous intensity activities achieving a minimum total physical activity of at least 600 minutes/week.

- **Low Physical Activity:** is the lowest level of physical activity. Those individuals who do not meet the criteria for moderate and high are considered as 'low'.

- **Central obesity:** Central obesity was defined as having a waist circumference of ≥94 cm for men and ≥80 cm for women. [9].

5. RESULTS

A total of 836 factory workers who had more than five years of experience were participated in the study making the response rate at 100%. Among these, 6(0.7%) participants' data were excluded from the analysis due to incomplete information. Hence, the analysis was made based on 830(99.3%) sample. All shift workers were working three shifts rotating every week.

5.1. Socio demographic characteristics of respondents

Four hundred thirteen (49.8%) of the respondents were shift workers with shift to day time workers ratio to of 1:1. Six hundred seventy nine (81.8%) of the participants were males. Males were over represented among shift workers than day time workers, which constitute 378(55.7%) ($p<0.01$). Day time workers were significantly more likely to be younger than night shift workers (mean (sd) age = 39±10 years versus 42±10 years; p-value<0.01).

Regarding educational status, day-time workers were significantly more likely to have tertiary (diploma and above) education compared to shift workers (32.2% versus19.4%; p-value<0.001). Majority of shift workers (59.8 %) worked for more than 15 years while 107(25.9%) and 59(14.3%), worked for 5-10 years and less than 5 years respectively.

Ninety six (23.0%) day time workers and 59(14.0%) of shift workers belong to the highest wealth quintile. Among those in lowest income quintile 81(47.1%) were day time workers and 91(52.9%) shift workers ($p=0.006$). Table-1 shows detail of respondent's socio-demographic characteristics.

Table 1: Socio-demographic characteristics of day time and shift workers among Wonji Shoa sugar factor workers, East Shoa Oromia February 2012 (n=830)

Variable		Day time Workers, n=417(50.8%)	Shift Workers, n=413(49.2%)	Total, n=830(100%)	P- Value
Sex	Male	301(72.2%)	378(91.5%)	679(81.8%)	<0.001
	Female	116(27.8%)	35(8.5%)	151(18.2%)	
Age	20-29	80(19.2%)	52(12.6%)	132(15.9%)	0.001
	30-39	131(31.4%)	114(27.6%)	245(29.5%)	
	40-49	131(31.4%)	128(31.0%)	259(31.2%)	
	>50	75(18.0%)	119(28.8%)	194(23.4%)	
Educational status	Elementary(1-8)	136(32.6%)	214(51.8%)	350(42.2%)	<0.001
	High school (9-12)	147(35.3%)	119(28.8%)	266(32%)	
	Tertiary education	134(32.1%)	80(19.4%)	214 (25.8%)	
Monthly income	<600 ETB	81(19.4%)	91(22.0%)	172(20.7%)	0.004
(in quintile)	601-1040 ETB	81(19.4%)	85(20.6%)	166(20.0%)	
	1041-1600 ETB	68(16.3%)	96(23.2%)	164(19.8%)	
	1601-2400 ETB	91(21.8%)	83(20.1%)	174(21.0%)	
	2400 -7000 ETB	96(23.0%)	59(14.0%)	154(18.6%)	
Working year	≤10 years	121(29.0%)	63(15.3%)	184(22.2%)	<0.001
in the factory	11-15 years	80(19.2%)	98(23.7%)	178(21.4%)	
	16-22 years	70(16.8%)	67(16.2%)	137(16.5%)	
	23-30years	85(20.4%)	100(24.2%)	185(22.3%)	
	>30 years	61(14.6%)	85(20.6%)	146(17.6%)	
Smoking habit	Smoker	27(6.5%)	54(13.1%)	81(9.8%)	0.003
	Non smoker	390(93.5%)	359(86.9%)	696(90.2%)	
Alcohol drinking	Drinker	77(18.5%)	110(26.6%)	187(22.5%)	0.005
	Non drinker	340(81.5%)	303(73.4%)	643(77.5%)	

5.2 Prevalence of overweight and obesity among shift and day time workers

Figure-1 shows distribution of overweight and obesity among shift and day time workers. The overall prevalence of overweight/obesity was 36.7% and 30.9% among day time and shift workers respectively *(p-value=0.13)*. Overweight was found to be 131(31.4%) in the day time workers whereas 115(27.8%) in shift workers. Twenty one (5.0%) of day time workers and 13(3.1%) of the shift workers were found to be obese *(p-value=0.18)*.

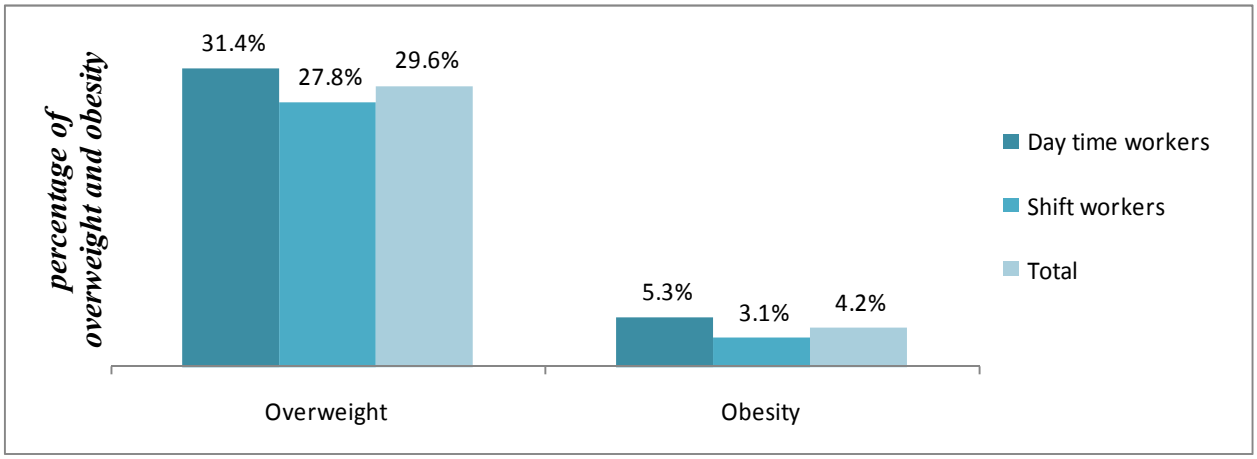

Figure-2 Percentage of overweight and Obesity among day and shift workers in Wonji Shoa sugar factory, May 2012(N=830)

It was found that overweight was more prevalent in the age groups of 40-49 years in both day and shift workers which is 52(39.7%) and 42(32.8%) respectively. By contrast, obesity was more prevalent in the age group 30-39 in day time workers and 40-49 years in shift workers which is 10(7.6%) and 7(5.5%) respectively.

Table -2 Distribution of overweight and obesity by Age among day and shift workers in Wonji Shoa sugar factory, May2012 (n=830)

	Day time worker		***Shift worker***	
Age groups	***Obese***	***Overweight***	***Obese***	***Overweight***
20-29 years	0(-)	14(10.7%)	0(-)	6(5.2%)
30-39 years	10(47.6%)	38(29%)	3(23.1%)	32(27.8%)
40-49 years	7(33.3%)	52(39.7%)	7(53.8%)	42(36.5%)
>50 years	4(19.0%)	27(20.6%)	3(23.1%)	35(30.4%)

Both overweight and obesity were more prevalent in females than males among day and shift workers. Overweight was 29.2% versus 37.1% among day time workers and 27.5% versus 31.4% among shift workers in males and females respectively. Obesity was 3.0% versus 11.2% among day time workers and 2.6% versus 8.6% among shift workers in males and females, respectively (P- Value ;<0.05).

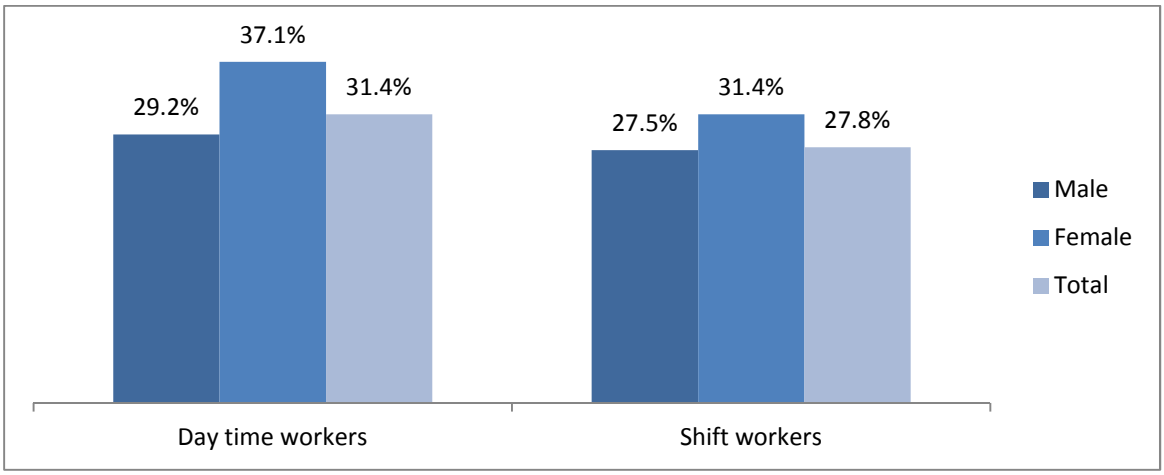

Figure-3 Percentage of overweight by Sex among day and shift workers in Wonji Shoa Sugar Factory May 2012(N=830)

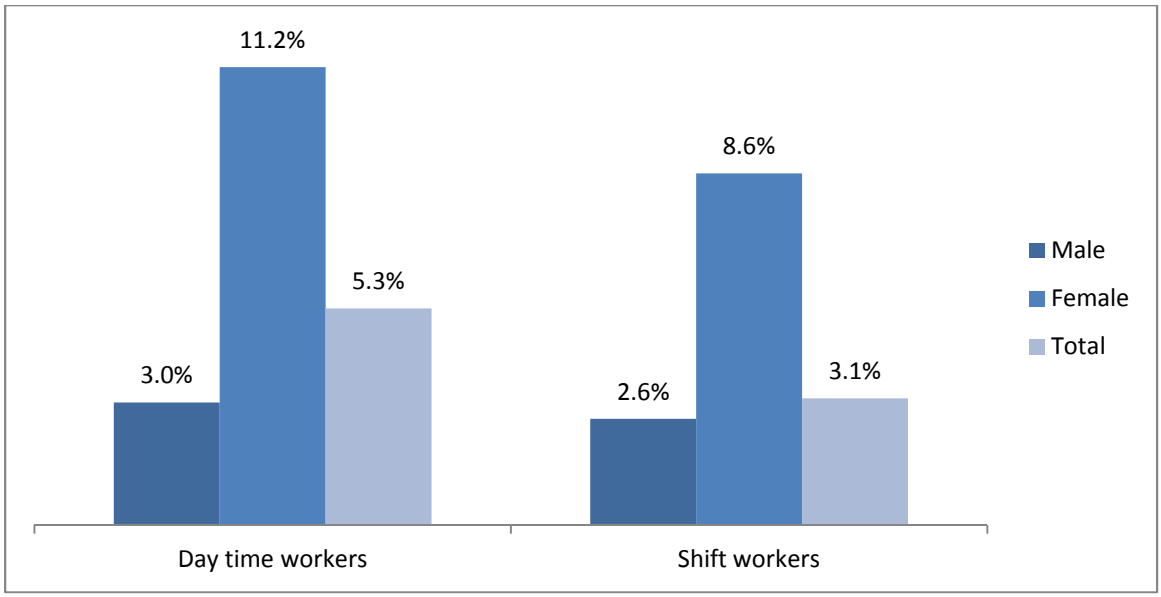

Figure-4 Percentage of obesity by Sex among day and shift workers in Wonji Shoa Sugar Factory, May 2012(N=830)

5.3 Prevalence of central obesity among day time and shift workers

The overall prevalence of central obesity, as measured by waist circumference was 19.2% (95%CI=16.5%, 21.9%), 86(20.6%) in day time workers and 73(17.7%) in shift workers *(p-value=0.095).* It was found that 84(12.4%) males and 75(49.7%) females were centrally obese($p<0.01$). Central obesity was also more prevalent in the age groups of 40-49 years which was 22.4%, of which 21.4% and 23.4% in day time and shift workers respectively.

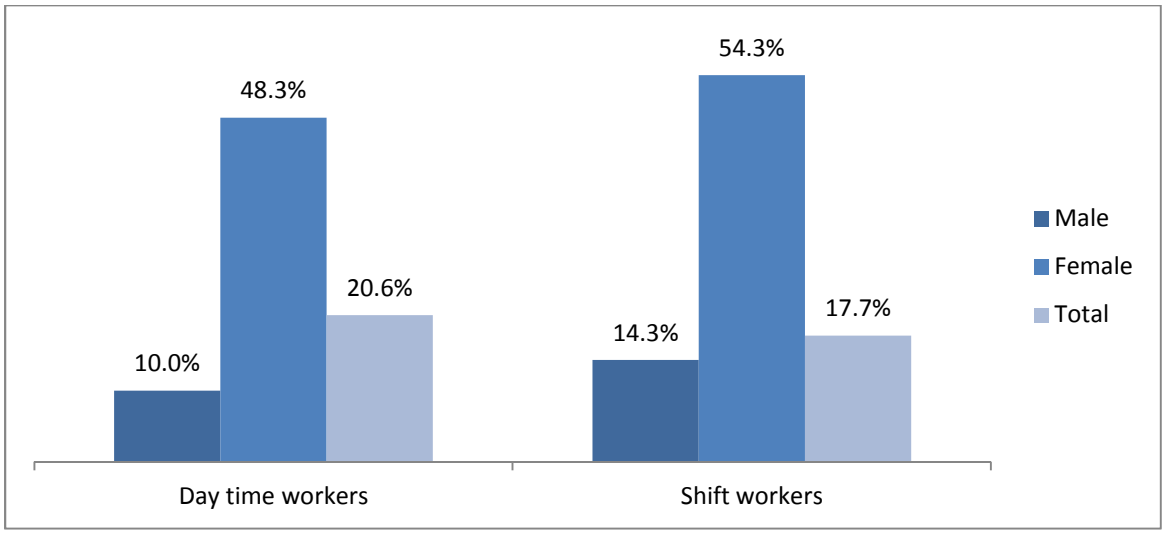

Figure-5 Percentage of Central obesity by Sex among Day and Shift workers in Wonji Shoa sugar factory, May 2012(n=830)

5.4 Prevalence of hypertension among day time and shift workers

Figure- 4 shows the prevalence of hypertension among day and shift workers. The overall prevalence of hypertension in the study participants is 36.4% *(95% CI=33.1%, 39.7%).* Shift workers were significantly more likely to have hypertension than day time workers (177(42.9%) versus 125(30.0%); *p-value<0.001).* Among those who had hypertension 73(58.4%) of day time workers and 115(65.0%) shift workers were diagnosed during the survey for the first time; the rest (41.6% from day time workers and 35% from shift workers) were already on treatment for hypertension. Similarly, 30.8% of participants were diagnosed to have hypertension (28.0% of day time workers and 32.8% of shift workers; p-value*<0.001*) had a family history of hypertension.

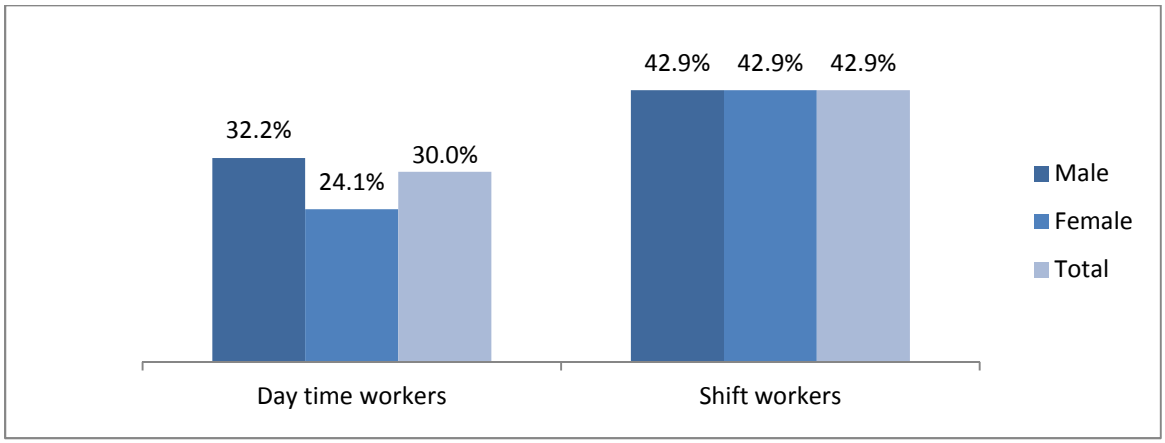

Figure-6 Distribution of Hypertension by Sex among Day and Shift workers

Hypertension was significantly higher among males compared to females; which is 38.1% *(95%CI=34.8%, 41.4%)* in males (32.2% in day time workers and 42.9% in shift workers) compared to 28.5% *(95%CI=25.4%, 31.6%)* in females (24.1% in day time workers and 42.9% in shift workers) *(p-value=0.03).*

It was also found that Hypertension was more prevalent in the age groups of above 50 years which is 54.1% (49.3% in day time and 57.1% in shift workers) followed by 40-49 years which was 44.0% (35.1% in day time workers and 53.1% in shift workers).

5.5 Respondents Characteristics on Diet

Table-3 shows respondents' characteristics on diet. Consumption patterns of the participants for various food groups were studied using a Food Frequency Questionnaire (FFQ). More than half 581(70.0%) of respondents [233(56.4%) and 348(83.5%) in day-time and shift workers] consumed of three or less meals per day, respectively. About 609(73.4%) of respondents, 322(77.2%) of day time workers and 287(69.5%) of the shift workers, consume vegetables more

than once per day. More than half 603(72.7%) of respondents, 272(65.2%) of day time workers and 331(80.1%) of shift workers, claimed that they did consume meat once or less per week. Likewise about 521(62.8%) of respondents, 247(59.2%) of day time workers and 274(66.3%) of shift workers, claimed that they did not consume fruits once or less per week. *Table-3 shows detail of respondent's characteristics on diet.*

Table-3 Characteristics of Diet among day and shift workers in Wonji Shoa sugar factory, Oromia Region, East Shoa Zone, May 2012(N=830)

Variable	Day time Workers, n=417(50.8%)	Shift Workers, n=413(49.2%)	Total, n=830(100%)	P- Value
Number of meals per day				
>3 per day	180(43.6%)	69(16.5%)	249(30.0%)	0.001
≤3 per day	233(56.4%)	348(83.5%)	581(70.0%)	
Intake of bread and cereals per day				
More than once	131(31.4%)	165(40.0%)	296(35.7%)	0.013
Once or Less than once	286(68.6%)	248(60.0%)	534(64.3%)	
Intake of vegetable per week				
More than once	322(77.2%)	287(69.5%)	609(73.4%)	0.012
Once or Less than once	95(22.8%)	126(30.5%)	221(26.6%)	
Intake of fruits per week	170(40.8%)	139(33.7%)	309(37.2%)	0.041
More than once	247(59.2%	274(66.3%)	521(62.8%)	
Once or Less than once				
Intake of meat and egg per week	.			
More than once	145(34.8%)	82(19.9%)	227(27.3%)	<0.001
Once or Less than once	272(65.2%)	331(80.1%)	603(72.7%)	
Intake of fat per week				
More than once	215(51.6%)	142(34.4%)	357(43.0%)	<0.001
Once or Less than once	202(48.4%)	271(65.6%)	473(57.0%)	
Intake of Milk and products per day				
More than once	195(46.8%)	123(29.8%)	318(38.3%)	<0.001
Once or Less than once	222(53.2%)	290(70.2%)	512(61.7%)	
Intake of sugar per day	180(43.2%)	269(65.1%)	449(54.1%)	<0.001
More than once	237(56.8%)	144(34.9%)	381(45.9%)	
Once or Less than once				

5.6 Respondent's characteristics of physical exercise

Concerning physical activity of the participants more than half 503(60.6%) of respondents spent more than two hours on following TV programs, video games or computer per day, of which 268(64.3%) and 235(56.9%) in day and shift workers, respectively.

About 265(31.9%) of respondents, 80(19.2%) of day time workers and 185(44.8%) of the shift workers usually spent less than six hours by sleeping per day. Almost half 50.6% of respondents, 240(57.5%) of day time workers and 180(43.6%) of shift workers, usually sleep six to nine hours per day.

Concerning physical activity, respondents were evaluated using International Physical Activity Questionnaire (IPAQ). Data collected with IPAQ questions were analyzed as categorical variables. Accordingly 239(28.8%), 485(58.4%) and 106(12.8%) were categorized as having low, moderate and high physical activity respectively, with males being more active *($p < 0.01$). Table-4 shows detail of respondents characteristics on physical activities.*

Table 4: Sedentary lifestyle and physical activity of respondents among day time and shift workers of wonji shoa sugar factory workers, East Shoa ,Oromia May 2012(n=830)

Variable	Day time Workers, n=417(50.8%)	Shift Workers, n=413(49.2%)	Total n=830(100%)	p-value
Hours spent with TV programs, video games or computer/day				
> 120 min/day	224(53.7%)	174(42.1%)	503(60.6%)	*0.001*
≤120 min/day	193(46.3%)	239(57.9%)	432(52.0%)	
Hours spent with sleeping per day				
< 6 hours	121(29.0%)	197(47.7%)	318(38.3%)	*<0.001*
6-9 hours	166(39.8%)	161(39.0%)	327(39.4%)	
>9 hours	130(31.2%)	55(13.3%)	185(22.3%)	
Transportation from home to work				
Walking	139(33.3%)	169(40.9%)	308(37.1%)	*<0.001*
Cycle	198(47.5%)	209(50.6%)	407(49.0%)	
Driven	80(19.2%)	35(8.5%)	115(5.6%)	
Physical activity				
Low	171(41.0%)	68(16.5%)	239(28.8%)	*<0.001*
Moderate	236(56.6%)	249(60.3%)	485(58.4%)	
High	10(2.4%)	96(23.2%)	106(12.8%)	

5.6 Determinants of hypertension

Binary logistic regression analysis was run to see associations between selected socio demographic characteristics, nutritional and physical activities variables with hypertension. As shown in Table 5, Hypertension was associated with shift work, male sex, older age, high income quintile, more working experience in the factory, alcohol drinking and family history of hypertension.

To identify the important socio demographic, nutritional and physical activities variables which are independently associated with hypertension, selected variables with P-value ≤ 0.3 were included in logistic regression analysis and some of the variables. Accordingly, shift work, older age, higher income quintile, and family history of hypertension were found to be independently associated with Hypertension.

Shift workers were about 48% more likely to be hypertensive when compared with day time workers *[AOR (95% CI) = 1.48 (1.02, 2.14)]*. Females were found to be 61% less likely to develop hypertension when compared with males *[COR (95%) = 0.39 (0.28, 0.56).* but it did not show statistically significant association after adjustment.

Participants at age groups of 40-49 years and above 50 were almost three and half times *[AOR (95%)=3.56 (1.66,7.64)* and four times *[AOR(95%)=3.99 (1.65,9.67)]* more likely to be hypertensive when compared with the age groups of 20-29 years respectively.

Regarding the average monthly income, workers who have higher income quintile were found to be about three times more likely to be hypertensive when compared to workers whose income is in the lower quintile*[AOR(95%CI) =3.24(1.78,5.89)]*. Participants who were not alcohol drinkers were 37% less likely to be hypertensive when compared to Alcohol drinkers *[COR (95%CI)=0.63 (0.45,0.87)]*.

It is also found that study participants who have family history of hypertension were more than two times more likely to be hypertensive when compared with those who do not have family history*[AOR(95%)=2.24(1.54,3.26)]*. However, no association was seen between hypertension and smoking, educational status, nutritional and physical activity variables. *(Table-5)*

Table-5a Association between socio-demographic factors and hypertension among Wonji Shoa Sugar Factory Workers, May, 2012

Socio demographic variables		Hypertension Yes n(%)	Hypertension No n(%)	Crude OR (COR)	Adjusted OR (AOR)
Work pattern	*Day time*	125(30.0%)	292(70.0%)	1.00	1. 00
	Shift	177(42.9%)	236(57.1%)	1.75 (1.32,2.33)*	1.48 (1.02,2.14)*
Sex	Male	259(38.1%)	420(61.9%)	1.00	1. 00
	Female	43(28.5%)	108(71.5%)	***0.39 (0.28,0.56)****	0.91 (0.58,1.43)
Age	20-29	18(13.6%)	114(86.4%)	1.00	1. 00
	30-39	65(26.5%)	180(73.5%)	2.29 (1.29,4.05)*	1.82(0.93,3.58)
	40-49	114(44.0%)	145(56.0%)	4.98 (2.86,8.67)*	3.56(1.66,7.64)*
	>50	105(54.1%)	89(45.9%)	7.47 (4.22,13.23)*	3.99(1.65,9.67)*
Educational status					
	Elementary(1-8)	131(37.4%)	219(62.6%)	1.00	1. 00
	High school (9-12)	90(33.8%)	176(66.2%)	0.85(0.61,1.19)	0.88(0.59,1.32)
	Diploma	66(39.3%)	102(60.7%)	1.08(0.74,1.57)	1.36(0.83,2.25)
	Degree and above	15(32.6%)	31(67.4%)	0.81(0.42,1.55)	0.66(0.29,1.49)
Monthly income	<600	38(22.1%)	134(77.9%)	1.00	1. 00
(in quintile)	600-1040	45(27.1%)	121(72.9%)	1.31(0.79,2.16)	1.09(0.64,1.88)
	1040-1600	62(37.8%)	102(62.2%)	2.14(1.33,3.46)*	1.41(0.81,2.41)
	1600-2400	70(40.2%)	104(59.8%)	2.37(1.48,3.80)*	1.46(0.84,2.53)
	>2400	87(56.5%)	67(43.5%)	4.58(2.83,7.41)*	3.24(1.78,5.89)*
Working years in the factory					
	<10 years	33(17.9%)	151(82.1%)	1.00	1. 00
	10-15 years	52(29.2%)	126(70.8%)	1.89(1.15,3.10)*	1.07(0.60,1.92)
	15-22 years	54(39.4%)	83(60.6%)	2.98(1.79,4.95)*	1.17(0.62,2.21)
	22-30 years	85(45.9%)	100(54.1%)	3.89(2.42,6.25)*	1.14(0.58,2.24)
	>30 years	78(53.4%)	68(46.6%)	*5.25(3.19,8.63)**	1.17(0.53,2.59)
Smoking habit					
	Current Smoker	28(34.6%)	53(65.4%)	1.00	1. 00
	Non smoker	274(36.6%)	475(63.4%)	1.09(0.67,1.77)	1.66(0.95,2.89)
Alcohol drinking					
	Drinker	84(44.9%)	103(55.1%)	1.00	1. 00
	Non drinker	218(33.9%)	425(66.1%)	***0.63 (0.45,0.87)****	0.68(0.46,1.02)

Family history of hypertension				
Yes	93(51.7%)	87(48.3%)	2.26(1.61,3.15)*	2.24(1.54,3.26)*
No	209(32.2%)	441(67.8%)	1.00	1. 00

Table-5b Association between nutritional and physical activity factors and hypertension among Wonji Shoa Sugar Factory Workers, May 2012

Dietary and physical activity variables		Hypertension Yes n(%)	No n(%)	Crude OR (COR)	Adjusted OR (AOR)
Intake of bread and cereals/day		115(38.9%)	181(61.1%)	1.00	1. 00
	More than once	187(35.0%)	347(65.0%)	0.85(0.63,1.14)	0.94(0.68,1.31)
Once or less than once					
Intake of vegetables					
Per day	More than once	211(34.7%)	397(65.3%)	1.00	1. 00
	Once or less than once	91(41.0%)	131(59.0%)	1.31(0.95,1.79)	1.31(0.92,1.87)
Intake of milk and milk products per week					
More than once		104(32.8%)	213(67.2%)	1.00	1. 00
Once or less than once		198(38.6%)	315(61.4%)	1.28(0.96,1.73)	1.09(0.78,1.57)
Hours spent with sleeping per day	< 6 hours	123(38.8%)	194(61.2%)	1.00	1. 00
	6-9 hours	122(37.3%)	205(38.8%)	0.94(0.68,1.29)	0.98(0.69,1.40)
	>9 hours	57(30.6%)	129(69.4%)	0.69(0.47,1.02)	0.84(0.54,1.30)
Physical activity	Low	79(33.1%)	160(66.9%)	1.00	1. 00
	Moderate	185(38.1%)	300(61.9%)	1.23(0.90,1.73)	1.48(0.97,2.28)
	High	38(35.8%)	68(64.2%)	1.13(0.70,1.83)	1.27(0.68,2.36)

AOR: Adjusted for work pattern, Sex, Age, Educational status, Smoking habit, alcohol drinking, Family history of hypertension, working year in the factory consumption of bread and cereals, consumption of vegetables, consumption of milk products, time spent on sleeping and physical activity.

* = Statistically significant

5.7 Determinants of Overweight/obesity

Binary logistic regression analysis was run to see associations between selected socio demographic characteristics, as well as nutritional and physical activities variables with overweight/obesity. The results show that the condition of being overweight/obesity is associated with female sex, older age, higher educational status, higher income quintile, more working experience in the factory, non smoking habits and low physical activities. But, physical activity loss it's significant association with overweight/obesity after adjustment.

Shift workers were about 41% more likely to be overweight /obese when compared with day time workers [AOR (95% CI) = 1.41 (0.94, 2.09)] although it is not statistically significant. Females were found to be two times more likely to be overweight / obese when compared with males [AOR (95%) = *2.0 (1.29, 3.10)*].

Participants at age groups of 40-49 years and above fifty year were more than five and half times *[AOR(95%)=5.58(2.55,12.21)]* and three times *[AOR(95%)=3.09(1.21,7.91)]* more likely to be overweight/obese when compared with the age groups of 20-29 years respectively.

Regarding the average monthly income, workers who have higher income quintile were found to be more than seven times more likely to be overweight/ obese when compared to workers whose income is in the lower quintile *[AOR (95%CI) =7.29(3.85, 13.79)]*. Non smokers were more than two times more likely to be overweight/obese when compared to current smokers *[AOR (95%CI) =2.28(1.19, 4.37)]*.

Eating bread, cereals, vegetables more than once per day and meat, egg, and fat more than once a week were also analyzed and found statistically associated to overweight/obesity with *[AOR= 0.67 (0.48,0.95)], [AOR=1.47(1.01,2.13)], [AOR=0.45(0.28,0.73) and [AOR= 0.25 (0.16,0.39)] respectively. (Table-7)*

Table-6a Association between socio-demographic factors and overweight/obesity among Wonji shoa sugar factory worker, May, 2012

Variable		Overweight/Obesity		Crude OR	Adjusted OR
		Yes n(%)	No n(%)	(COR)	(AOR)
Work pattern	Day time	153(36.7%)	264(63.3%)	1.00	1. 00
	Shift	130(31.5%)	283(68.5%)	0.79 (0.59,1.06)	1.41 (0.94,2.09)
Sex	Male	212(31.2%)	467(68.8%)	1.00	1. 00
	Female	71(47.0%)	80(53.0%)	1.96 (1.37,2.79)*	2.00 (1.29,3.10)*
Age	20-29	20(15.2%)	112(84.8%)	1.00	1. 00
	30-39	83(33.9%)	162(66.1%)	2.87(1.66,4.94)*	2.69(1.36,5.29)*
	40-49	110(42.5%)	149(57.5%)	4.13(2.42,7.06)*	5.58(2.55,12.21)*
	>50	70(36.1%)	124(63.9%)	3.16(1.81,5.53)*	3.09(1.21,7.91)*
Educational status	Primary(1-8)	85(24.3%)	265(75.7%)	1.00	1. 00
	Secondary(9-12)	103(38.7%)	163(61.3%)	1.97(1.39,2.78)*	1.53(1.01,2.33)*
	Tertiary	95(44.4%)	119(55.6%)	2.48(1.73,3.58)*	1.43(0.87,2.35)
Monthly income (in quintile)	<600	31(18.0%)	141(82.0%)	1.00	1. 00
	600-1040	40(24.1%)	126(75.9%)	1.44(0.85,2.45)	1.58(0.88,2.84)
	1040-1600	47(28.7%)	117(71.3%)	1.83(1.09,3.06)*	1.74(0.95,3.17)
	1600-2400	70(40.2%)	104(59.8%)	3.06(1.87,5.01)*	2.65(1.47,4.76)*
	>2400	95(61.7%)	59(38.5%)	7.32(4.4,12.15)*	7.29(3.85,13.79)*
Working year in the factory					
	≤10 years	54(29.3%)	130(70.7%)	1.00	1. 00
	10-15 years	59(33.1%)	119(66.9%)	1.19(0.76,1.86)	0.81(0.46,1.44)
	16-22 years	52(38.0%)	85(62.0%)	1.47(0.92,2.35)	0.53(0.28,1.01)
	23-30 years	60(32.4%)	125(67.6%)	1.16(0.74,1.79)	0.31(0.15,0.63)*
	>30 years	58(39.7%)	88(60.3%)	1.59(1.003,2.51)*	0.57(0.25,1.32)
Smoking habit	Current Smoker	16(19.8%)	65(80.2%)	1.00	1. 00
	Non smoker	251(35.6%)	482(64.4%)	2.25(1.28,3.97)*	2.28(1.19,4.37)*
Alcohol drinking	Drinker	59(31.6%)	128(68.4%)	1.00	1. 00
	Non drinker	224(34.8%)	419(65.2%)	1.16 (0.82,1.64)	1.07(0.70,1.65)

Table-6b Association between dietary and physical activity factors and overweight/obesity among Wonji shoa sugar factory worker, May, 2012

variable	Overweight/Obes		Crude OR	Adjusted OR
	Yes n(%)	No n(%)	(COR)	(AOR)
Number of meals				
>3 meals per day	77(30.8%)	173(69.2%)	1.00	1. 00
≤3 meals per day	206(35.5%)	374(65.5%)	1.24(0.90,1.70)	1.15(0.78,1.68)
Intake of bread and cereals/day				
More than once	111(37.5%)	185(62.5%)	1.00	1. 00
Once or less than once	172(32.2%)	362(67.8%)	0.79(0.59,1.07)	***0.67(0.48,0.95)****
Intake of vegetables Per day				
More than once	199(32.7%)	409(67.3%)	1.00	1. 00
Once or less than once	84(37.8%)	138(62.2%)	1.25(0.91,1.72)	***1.47(1.01,2.09*)***
Intake of meat and egg per week				
More than once	85(37.4%)	142(62.6%)	1.00	1. 00
Once or less than once	198(32.8%)	405(67.2%)	0.82(0.59,1.12)	***0.45(0.28,0.73)****
Intake of fat per week				
More than once	162(45.4%)	195(54.6%)	1.00	1. 00
Once or less than once	121(25.6%)	352(74.4%)	0.41(0.31,0.55)	***0.25(0.16,0.39)****
Physical activity				
Low	101(42.3%)	138(57.7%)	1.00	1. 00
Moderate	157(32.4%)	328(67.6%)	**0.65(0.47,0.90)***	0.93(0.61,1.44)
High	25(23.6%)	81(76.4%)	**0.42(0.25,0.71)***	0.76(0.39,1.47)

AOR: Adjusted for work pattern, Sex, Age, Educational status, working year in the factory, Smoking habit, alcohol drinking, , frequency of meals, consumption of bread and cereals, consumption of vegetables, consumption of meat and egg, consumption of fat and physical activity.

* = Statistically significant

6. DISCUSSION

A major challenge in the field of chronic diseases is to identify the key determinants and to evaluate how these critical pathways can best be modified to reduce these risk factors. A major objective of this study was to determining and comparing the effect of shift working on BMI and hypertension among randomly selected factory workers. Findings from this study showed a high prevalence of hypertension (36.4%) and overweight (29.6%) in the factory workers. This result is consistent with previous study conducted in Addis Ababa which reported high prevalence of hypertension (31.0%) and overweight (20.5% in males and 37.4% in females) (28).

The recently published data on shift work and obesity are inconsistent but overall provide some support for an adverse association. In our study, there was no significant difference in the prevalence of overweight/obesity between day time and shift workers. These results are consistent with previous studies which reported no significant associations [15, 20]. However, other study from Malaysia and Italy showed that there is a clear relationship between shift work and overweight/obesity [10, 12]. This difference might be due to the fact that the former study included only female participants without accounting for dietary habits.

Another cross sectional study involving 319 randomly selected Subjects among workers in Italy also showed that obesity was more prevalent in shift workers than in day time workers ($p<0.05$). This difference in the finding might be in their study fasting insulin levels were controlled as confounders; however exercise was not taken into account which is a significant factor when determining BMI [12].

Regarding hypertension, our results indicated that the prevalence of hypertension among shift workers was significantly higher compared to day time workers, which is consistent with finding from previous study among shift workers in Malaysia [17]. However, we found a much higher prevalence of hypertension among shift workers, which was 49.9% compared to their study which reported 22.4%. The difference in the finding could be explained by the fact that known hypertensive or diabetic patients were excluded from the study. But, in contrary to findings of another study in Brazil among the nurses which showed no significant association between shift work and hypertension [27]. This might be their study did not evaluate the duration of shift work. These biases may have led to underestimation of the association between shift work and hypertension.

An increased susceptibility of shift workers to develop hypertension can be explained by the fact that shift work triggers the effects of other lifestyle-related factors, such as disruption of circadian rhythms, stress, and behavior modification. Behavior modification includes increase in smoking, drinking, unhealthy diet, and decrease in physical activity [17]. In this study, the proportion of smokers and drinkers was significantly higher among shift workers. However, this trend is contradicted by the finding that both sedentary life style and low physical activity were significantly higher among day time workers. This finding was consistent with a previous study in another population of shift workers in Sweden and Finland [16, 19]. This study also found significantly higher level of physical activity (P-value; *<0.001*) among shift workers compared with day workers which is in contrary to results from another study conducted in Australia [26]. This difference in the finding might be the difference between the study participants; which is only nurses and midwife in their study where as involving different occupations in this study.

Even though it did not reach statistical significance, in this study the prevalence of central obesity was higher among day time workers; which is 20.6% in day time workers and 17.7% in shift workers. However, One study which is conducted in Italy among rotating shift workers showed that shift workers were more likely to be centrally obese(P-value;<0.001)[12]. This difference in the finding might be higher prevalence of general obesity among shift workers than day time workers in their study.

7. STRENGTHS AND LIMITATIONS OF THE STUDY

Strength of the study

- The study relied on relatively comprehensive assessment of chronic disease risk factors including behavioral markers (physical activity, dietary intake, alcohol drinking and smoking) and Height, weight and blood pressure measurements using standard instruments.
- The present research used a comparative design with sufficient sample among daytime and shift workers which allowed more precise estimate of the outcome indicators and analysis of determinant factors.

Limitations of the study

- This study relied on cross-sectional data, which precluded the possibility of drawing definite conclusions regarding causality and temporal relationships between risk factors such as smoking, drinking with shift working and vice versa.
- It is possible that there could be social desirability bias as participants are likely to withhold information regarding potentially negative life-styles such as smoking, alcohol drinking. However, we do not think this underreporting will be any different between day time and shift workers.
- The study has not employed more robust biochemical tests (such as cholesterol/triglyceride, glucose level) that could be used to measure chronic disease risk in a more concrete way.
- Lack of local studies for comparison.

8. CONCLUSIONS

- Findings from this study shows that a substantial segment of factory workers have hypertension, the prevalence being significantly higher among shift workers.
- As high as 62.3% of the hypertensive's were found to have high blood pressure for the first time during the survey.
- The finding suggests that shift work is associated with higher likelihood of being hypertensive in factory workers after controlling for observed determinant factors.
- Being in shift work, older age (above 30 years), higher income quintile, and family history of hypertension were found to be significant predictors of hypertension in the factory workers.
- Shift workers were more likely to be overweight/ obese compared to day time workers; even though it was not statistically significant.
- Being female, older, higher educational status, higher income quintile, longer working experience in the factory and non smoking habits were significantly associated with the condition of being overweight/obesity.
- Shift works were more likely to develop some unhealthy behaviors, including smoking and drinking compared to day time workers.

9. RECOMMENDATIONS

Based on the findings the following recommendations are made:

For individuals/factory workers

- Giving proper counseling for those who working this unconventional shift by health professionals. Ideally, this should be done before the worker begins his/her shift work.
- Health education programs should be given to the factory workers on how to maintain proper body weight; by giving special attention for females, and prevention and control of hypertension.
- Factory workers have to be informed of the importance of regular medical checkup for early detection of hypertension and other risk factors.

To factory managers

- Scheduling efficient health screening and regular checkup programs combined with support in controlling unhealthy lifestyle factors has the potential to be of considerable benefit in maintaining the health of shift workers.
- Shift schedule design is particularly important; although there are no ideal shift patterns, factors such as shift duration, direction of rotation, changeover times, and work/rest sequences all affect adaptation and effort needs to be made to avoid protracted exposure to shift work.

For Policy makers

- Developing clear policies and guidelines for managing shift-working arrangements ensures that people throughout the organization, no matter how large or small, are aware that preventing or limiting the risks of shift working needs to be considered at all levels of planning.

Implication for further Research

- Future studies should investigate the relations between shift work and other putative cardiovascular risk factors, including psychosocial job strain.
- In addition, further research on disease mechanisms is needed if we want to reduce the increased risk of hypertension among shift workers.
- Finally, we strongly recommend the researchers' further studies should also measure biochemical tests to examine the relationship with subclinical forms of chronic diseases and their risk factors including dyslipidimia and diabetes.

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11. ANNEXES

Annex I: Informed consent form (English Version)

Addis Ababa University, School of Public Health

Information sheet

Hello!

We came from Addis Ababa University, College of Health Science, School of Public Health to conduct a research on comparison of measures of adiposity and hypertension among shift workers and day time workers. The aim of the study is to know and assess the burden of overweight/obesity and hypertension and to see the difference between shift and day workers. Therefore, this study will have a great contribution in the control and prevention of obesity and related chronic diseases. Besides, we believe that this study will help in attracting governmental and non-governmental organizations and contribute their part on these problems.

During the study height, weight, waist circumference, and blood pressure will be measured using standardized instruments. Only light clothes will be allowed during measurement of body weight and Height will be measured using measuring board with bare foot. You will be also interviewed about your feeding practice, physical activity and health habits. This study does not bring any harm to your health. If you feel discomfort with the questions, please feel free to withdraw at any time you want. The interview and measurements will take about 30 minutes.

Finally what we want to assure you that your name and address will not be mentioned and handed over to others. However, the result will be organized and documented and might be submitted/given to the concerned Health Organizations or other bodies.

Principal Investigator Address:

Henok Asresahegn Asfaw

Tel: +251-911-57-11-39

Email: hasresahegn@hotmail.com

Consent form

Having the above information, I invite you to participate in the study.

I, the under signed, would like to confirm that, as I gave consent to participate in the study with clear understanding and recognition of:

1. The objective of the study
2. My right to resign from the study at any stage of the study

I confirmed my agreement with my signature after the detailed objective of the study has been explained to me in the language I understand well.

Signature (participant's) _____ Signature (collectors) _____

Date _____ Date _____

ANNEX II. Survey Questionnaire (English Version)

Addis Ababa University, School Of Public Health

Survey Questionnaire to Assess Nutritional Status of Adolescents

PART ONE: BACK GROUND CHARACTERISTICS

ID No._____

No	Questions	Choice	Code
101	Age of the respondent	_____	
102	What is your educational status?	A. Illiterate B. Less than grade 10 C. Diploma D. BSC E. Masters/ PhD	
103	Sex of the respondent	A. Male B. Female	
104	What is your Religion?	A. Orthodox B. Catholic C. Protestant D. Muslim E. Other(specify)	
105	What is your current marital status?	A. Single B. Married C. Widowed D. Divorced	
106	For how many years do you work in the factory?	_____	
107	What is your usual work pattern?	A. Daytime worker B. Shifts worker	
108	Average monthly income	_____	
109	Smoking habit	A. Current smoker B. Non smoker C. Pervious smoker	

110	Alcohol drinking	A. Yes B. No	
111	Do you have family history of hypertension?	A. Yes B. No	
112	Diagnosed to have hypertension previously and on treatment?	A. Yes B. No	If no skip to 201
113	When was diagnosed to have hypertension?	_____	

PART-TWO: NUTRITION AND DIET INFORMATION

The next questions ask about diet that you usually eat. As you answer these questions please think of a typical month in the last year.			
No	Questions	Choices	Coding
201	How often do you eat Bread and Cereals?	Never Less than once a month Once to three times per month Once a week Two to four times per week Ones per day More than twice per day	
202	How often do you eat Greens and vegetables?	Never Less than once a month Once to three times per month Once a week Two to four times per week Ones per day More than twice per day	
203	How often do you eat Fruits?	Never Less than once a month Once to three times per month Once a week Two to four times per week	

		Ones per day More than twice per day	
204	How often do you eat Milk, cheeses, yogurt?	Never Less than once a month Once to three times per month Once a week Two to four times per week Ones per day More than twice per day	
205	How often do you eat Meat and eggs?	Never Less than once a month Once to three times per month Once a week Two to four times per week Ones per day More than twice per day	
206	How often do you eat Beans?	Never Less than once a month Once to three times per month Once a week Two to four times per week Ones per day More than twice per day	
207	How often do you eat Oil and fat?	Never Less than once a month Once to three times per month Once a week Two to four times per week Ones per day More than twice per day	
208	How often do you eat Sugar and sweets?	Never Less than once a month Once to three times per month	

		Once a week Two to four times per week Ones per day More than twice per day	

PART-THREE: EATING AND HEALTH HABITS

The next questions ask about your dieting habit for the last one year.			
No	Questions	Response	Coding
301	How many times you normally eat per day?	<1 meal a day 1 meal a day 2 meals a day 3 meals a day >3 meals a day	
302	How often do you eat Breakfast?	Daily Sometimes Never	
303	How often do you eat Lunch?	Daily Sometimes Never	
304	How often do you eat during Tea time?	Daily Sometimes Never	
305	How often do you eat Dinner?	Daily Sometimes Never	
306	How often do you eat during Bed time?	Daily Sometimes Never	
307	How often do you eat fast foods?	Daily Sometimes Never	
308	How often do you eat deep fries?	Daily Sometimes	

		Never	
309	How often do you eat visible fat in meat?	Daily Sometimes Never	
310	Hours spent with TV programs, video games or computer	<30min a day 30-60min a day 60-90min a day ≥120minutes a day	
311	Hours spent with sleeping	<6 hrs a day 6-9hrs a day ≥10hrs a day	
312	Which one do you usually use to go from home to school	Walking Cycle Driven	

PART-FOUR: PHYSICAL ACTIVITY QUESTIONNAIRE

Physical activity Questionnaire

Below are questions about individual's physical activity levels. Please read the descriptions and answer the questions even if you do not consider yourself to be an active person. Consider all activities, those you do at school, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.

Hard physical activity:

Think about all the ***vigorous activities*** which take hard physical effort that you did in the ***last 7 days***. Vigorous activities make your breath harder than normal and may include heavy lifting, aerobic, or fast bicycling. Think only about those physical activities that you did for at least 10 minutes at a time.

No.	**Questions**	**Choices**	
401	Do you engaged in work besides your education?	Yes No	
402	During the ***last 7 days***, on how many days did you do vigorous physical activities?	_____days/week _____don't know/not sure	

403	How much ***total time*** did you usually spend doing ***vigorous physical activities*** on one of those days?	_____hours/day _____minutes/day _____don't know/not sure	
404	If your pattern of activity varies from day to day, how much ***total time*** did you spend over the last 7 days doing ***vigorous physical activity***?	_____hours/day _____minutes/day _____don't know/not sure	
	Moderate physical activity: Think about the activities which take ***moderate physical effort*** that you did in the ***last 7 days***. Moderate physical activities make your breath somewhat harder than normal and may include carrying light loads, bicycling at a regular pace, or doubles tennis. Do not include walking. Again, think about only those physical activities that you did for at least 10 minutes.		
No	Questions	Choices	
405	During the last 7 days, on how many days did you do moderate physical activities?	_____hours/day _____minutes/day _____don't know/not sure	
406	How much ***total time*** did you usually spend doing ***moderate physical activities*** on one of those days?	_____hours/day _____minutes/day _____don't know/not sure	
407	If your pattern of activity varies from day to day or includes multiple tasks, how much ***total time*** did you spend over the last 7 days doing ***moderate physical activity?***	_____hours/day _____minutes/day _____don't know/not sure	
	Walking: Now think about the time you spend ***walking*** in the ***last 7 days***. This includes at work and at home, walking to travel from place to place, and any other walking that you might do solely for recreation, sport, exercise or leisure.		

408	During the ***last 7 days***, on how many days did you ***walk*** for at least 10 minutes at a time?	_____days/week _____don't know/not sure	
409	How much ***total time*** did you usually spend ***walking*** on one of those days?	_____hours/day _____minutes/day _____don't know/not sure	
410	If your pattern of activity varies from day to day or includes multiple tasks, how much ***total time*** did you spend ***walking*** over the last 7 days?	_____hours/day _____minutes/day _____don't know/not sure	
	Sitting: Finally, think about the time you spent ***sitting*** on weekdays during the ***last 7 days***. Include time spent at class, at home, while doing course work, and during leisure time. This may include time spent sitting at a desk, visiting friends, reading, and sitting or lying down to watch television.		
411	During the ***last 7 days*** how much ***total time*** did you usually spend sitting on a week day?	_____hours/weekday _____minutes/weekday _____don't know	

PART- FIVE: ANTHROPOMETRIC MEASURMENTS

Anthropometry				
No		Reading 1	Reading 2	Average
1	Height	_____	_____	
2	Weight	_____	_____	
3.	Waist circumference	_____	_____	
4.	Blood pressure	_____	_____	

Thank You!!

Annex III: Informed consent Form (Amharic Version)

አዲስ አበባ ዩኒቨርስቲ ጤና ሣይንስ ፋኩልቲ የህብረተሰብ ጤና አጠባበቅ ትምህርት ክፍል

የተሳታፊው መለያ ቁጥር _____

የመረጃ ቅፅ

ጤና ይስጥልን እንደምን ነህ/ ሽ!

እኛ የመጣነው ከአዲስ አበባ ዩኒቨርስቲ ጤና ሣይንስ ፋኩልቲ የህብረተሰብ ጤና አጠባበቅ ትምህርት ክፍል ሲሆን የመጣንበት ምክንያት ደግሞ በፈረቃ ሰራተኞች እና በቀን ሰራተኞች የአመጋገብ ሁኔታ እና የጤና ሁኔታ ላይ ጥናት ለማድረግ ነው፡፡የጥናቱ ዓላማ ደግሞ ከመጠን በላይ ክብደትን እና የደም ግፊት ያለውን ልዩነት ሰራተኞች መካከል ለመመልከት ነዉ።በመሰረቱም ይህ ጥናት እነዚህ ችግሮች በተለይም ደግሞ ከመጠን በላይ ክብደትና ተያያዝ ችግሮች ረገድ በመቆጣጠርና በመከላከል ትልቅ ሚና ይኖረዋል::በተጨማሪም ይህ ጥናት የተለያዩ መንግስታዊና መንግስታዊ ያልሆኑ ድርጅቶች በነዚህ ችግሮች ዙርያ እንዲሰሩና የተቻላቸውን እንዲያበረክቱ ያደርጋል የሚል ጽኑ እምነት አለን::

በጥናቱ ጊዜ የአንተን/ቺን ክብደት፤ ቁመት፤ የወገብ ስፋት እንዲሁም የደም ግፊትን ደረጃቸው በጠበቁ መሳሪያዎች እንለካለን፡፡ ክብደት በሚለካበት ጊዜ ቀለል ያሉ ልብሶች እንዲሁም ቁመት በሚለካበት ጊዜ ደግሞ በባዶ እግር ይሆናል:: ለምናጠናው ጥናት የተወሰኑ ጥያቄዎችን እጠይቅሀለሁ/እጠይቅሻለሁ፡፡በዚህ መጠይቅ የአመጋገብ ልምድ፣ስለአካላዊ እንቅስቃሴ ፣በመቀመጥ የምታሳልፈውን/ፊውን ጊዜ በተመለከተ እጠይቅሀለሁ/እጠይቅሻለሁ፡፡ ይህ ጥናት በአንተ/ቺ ላይ የሚያደርሰው ምንም አይነት የጤና ጉዳት አይኖርም።በመጠይቁ ጊዜ ጥሩ ስሜት ካልተሰማህ/ሽ በማንኛውም ጊዜ አቋርተህ/ሽ መሄድ ትችላለህ/ሽ፡፡መጠይቁ 30 ደቂቃ ያህል ይፈጃል፡፡

በመጨረሻም ከአንተ/ቺ የምንሰበስበው መረጃ ከስምህ/ሽ ጋር አይያያዝም ስምህን/ ሽን እና አድራሻህ /ሽ እንደማይጠቀስና ለማንም አካል ተላልፎ እንደማይሰጥ ልናረጋግጥልህ/ሽ እንወዳለን:: የዚህ ጥናት ውጤት ግን ተጠርዞ እና ተዘጋጅቶ ለሚመለከታቸው የጤና ድርጅቶች ወይም ለሌሎች አካላት ሊሰጥ ይችላል::

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<u>የስምምነት ማረጋገጫ ቅጽ</u>

ይህንን ግንዛቤ ውስጥ በማስገባት በጥናቱ ላይ እንድትሳተፍ/ፊ በክብር እንጠይቃለን፡፡

እኔ ከዚህ በታች ፊርማዬን የተቀመጠው በጥናቱ በፍቃደኝነት እሳተፋለሁ ስል የሚከተሉትን ግንዛቤ ውስጥ በማስገባት ነው::

1. የጥናቱ ዓላማ
2. በጥናቱ የሚካተቱ ጥያቄዎችንና የጥናቱ አስፈላጊነት

በሚገባኝ ቋንቋ ስለተገለጸልኝና ስለተብራራልኝ በጥናቱ ለመሳተፍ በፊርማዬ አረጋግጣለሁ::

ፊርማ(የተሳታፊ)_____ ፊርማ(የመረጃ ሰብሳቢ)_____

ቀን_____ ቀን_____

Annex IV: Survey Questionnaire (Amharic Version)

አዲስ አበባ ዩኒቨርስቲ ህክምና ሣይንስ ፋኩልቲ የህብረተሰብ ጤና አጠባበቅ ትምህርት ክፍል

ከጤና ጋር የተያያዘ የምርምር ወይም ጥናታዊ ፅሁፍ መረጃ መሰብሰቢያ የተዘጋጀ መጠይቅ

ክፍል አንድ: *መሰረታዊ መረጃዎችን የተመለከቱ ጥያቄዎች*

የሚከተሉትን ጥያቄዎች በጥንቃቄ ካነበቡ በኋላ ለእያንዳንዱ በተሰጠው የመልስ መስጫ ቦታ መልሱን ይሙሉ::

ተ.ቁ	ጥያቄ	መልስ
1.1	ዕድሜ	_____
1.2	ፆታ	ወንድ
		ሴት
1.3	የትምህርት ደረጃ	ከ 10^{ኛ} ክፍል በታች
		ዲፕሎማ
		ዲግሪ
		ማስተርስ እና ከዚያ በላይ
1.4	ሐይማኖት	ኦርቶዶክስ
		ካቶሊክ
		ፕሮቴስታንት
		ሙስሊም
		ሌላ ካለ ይጠቀስ _____
1.5	የጋብቻ ሁኔታ	ያላገባ/ች
		ያገባ/ች
		በፍቺ የተለያየ/ቺ
		ሌላ ካለ ይጠቀስ _____
1.6	በዚህ ፋብሪካ ውስጥ ለምን ያህል ጊዜ አገልግሎል?	_____
1.7	የስራ ሁኔታ	የቀን ሰራተኛ
		የፈራቃ ሰራተኛ
1.9	በአማካኝ የወር ገቢ	----------ብር።
1.10	ሲጋራ	አጫሽ አይደለሁም።
		ከዚህ በፊት ነበርኩ።
		አጨሳለሁ።
1.11	የአልኮል መጠጥ ይጠጣሉ?	አዎ።
		አይደለሁም።

ክፍል ሁለት፡ የአመጋገብ ሁኔታ

ከዚህ ቀጥሎ ባለፈው አንድ ዓመት አዘውትረህ/ሽ ስለተመገብካቸው/ሺያቸው ምግቦች በተመለከተ እጠይቃህለሁ/እጠይቃሽለሁ፡፡

ተ.ቁ	ጥያቄ	መልስ
2.1	በተለምዶ ዳቦ እና የእህል ውጤቶች በምን ያህል ጊዜ ይበላሉ?	በልቼ አላውቅም በወር ከአንድ ጊዜ በታች በወር ከአንድ እስከ ሦስት ጊዜ በሳምንት አንድ ጊዜ በሳምንት ከሁለት እስከ አራት ጊዜ በቀን አንድ ጊዜ በቀን ከሁለት ጊዜ በላይ
2.2	በተለምዶ አረንጓዴ ተክሎች እና አትክልቶች በምን ያህል ጊዜ ይበላሉ?	በልቼ አላውቅም በወር ከአንድ ጊዜ በታች በወር ከአንድ እስከ ሦስት ጊዜ በሳምንት አንድ ጊዜ በሳምንት ከሁለት እስከ አራት ጊዜ በቀን አንድ ጊዜ በቀን ከሁለት ጊዜ በላይ
2.3	በተለምዶ ፍራፍሬዎች በምን ያህል ጊዜ ይበላሉ?	በልቼ አላውቅም በወር ከአንድ ጊዜ በታች በወር ከአንድ እስከ ሦስት ጊዜ በሳምንት አንድ ጊዜ በሳምንት ከሁለት እስከ አራት ጊዜ በቀን አንድ ጊዜ በቀን ከሁለት ጊዜ በላይ

2.4	በተለምዶ ወተት፣ አይብ እና እርጎ በምን ያህል ጊዜ ይበላሉ?	በልቼ አላውቅም በወር ከአንድ ጊዜ በታች በወር ከአንድ እስከ ሦስት ጊዜ በሳምንት አንድ ጊዜ በሳምንት ከሁለት እስከ አራት ጊዜ በቀን አንድ ጊዜ በቀን ከሁለት ጊዜ በላይ
2.5	በተለምዶ ስጋና እና እንቁላል በምን ያህል ጊዜ ይበላሉ?	በልቼ አላውቅም በወር ከአንድ ጊዜ በታች በወር ከአንድ እስከ ሦስት ጊዜ በሳምንት አንድ ጊዜ በሳምንት ከሁለት እስከ አራት ጊዜ በቀን አንድ ጊዜ በቀን ከሁለት ጊዜ በላይ
2.6	በተለምዶ ባቄላ በምን ያህል ጊዜ ይበላሉ?	በልቼ አላውቅም በወር ከአንድ ጊዜ በታች በወር ከአንድ እስከ ሦስት ጊዜ በሳምንት አንድ ጊዜ በሳምንት ከሁለት እስከ አራት ጊዜ በቀን አንድ ጊዜ በቀን ከሁለት ጊዜ በላይ
2.7	በተለምዶ ዘይት እና ቅባት በምን ያህል ጊዜ ይበላሉ?	በልቼ አላውቅም በወር ከአንድ ጊዜ በታች በወር ከአንድ እስከ ሦስት ጊዜ በሳምንት አንድ ጊዜ በሳምንት ከሁለት እስከ አራት ጊዜ በቀን አንድ ጊዜ

		በቀን ከሁለት ጊዜ በላይ	
2.8	በተለምዶ ስኳር አዘል እና ጣፋጭ ምግቦች በምን ያህል ጊዜ ይበላሉ?	በልቼ አላውቅም በወር ከአንድ ጊዜ በታች በወር ከአንድ እስከ ሦስት ጊዜ በሳምንት አንድ ጊዜ በሳምንት ከሁለት እስከ አራት ጊዜ በቀን አንድ ጊዜ በቀን ከሁለት ጊዜ በላይ	

ክፍል ሦስት፡ የአመጋገብ ልምድ

ከዚህ ቀጥሎ በአለፈው አንድ ዓመት ስለነበረህ/ሽ የአመጋገብ ሁኔታ እጠይቃሀለሁ/ሻለሁ፡፡

ተ.ቁ	ጥያቄ	መልስ	ኮድ
3.0	በተለምዶ በቀን ለምን ያህል ጊዜ ይበላሉ?	በቀን ከአንድ ጊዜ በታች በቀን አንድ ጊዜ በቀን ሁለት ጊዜ በቀን ሦስት ጊዜ በቀን ከሦስት ጊዜ በላይ	
3.1	በተለምዶ ቁርስ በምን ያህል ጊዜ ይበላሉ?	በየቀኑ አንዳንድ ጊዜ በልቼ አላውቅም	
3.2	በተለምዶ በሻይ ሰዓት በምን ያህል ጊዜ ይበላሉ?	በየቀኑ አንዳንድ ጊዜ በልቼ አላውቅም	
3.3	በተለምዶ ምሳ በምን ያህል ጊዜ ይበላሉ?	በየቀኑ አንዳንድ ጊዜ በልቼ አላውቅም	
3.4	በተለምዶ መክሰስ በምን ያህል ጊዜ ይበላሉ?	በየቀኑ አንዳንድ ጊዜ በልቼ አላውቅም	
3.5	በተለምዶ ራት በምን ያህል ጊዜ ይበላሉ?	በየቀኑ አንዳንድ ጊዜ በልቼ አላውቅም	
3.6	በተለምዶ በመሻታ ሰዓት በምን ያህል ጊዜ ይበላሉ?	በየቀኑ አንዳንድ ጊዜ በልቼ አላውቅም	
3.7	በተለምዶ ፈጣን ምግቦችን(fast foods) በምን ያህል	በየቀኑ	

	ጊዜ ይበላሉ?	አንዳንድ ጊዜ በልቼ አላውቅም
3.8	በተለምዶ በስብ የተጠበሱ ምግቦችን በምን ያህል ጊዜ ይበላሉ?	በየቀኑ አንዳንድ ጊዜ በልቼ አላውቅም
3.9	በተለምዶ በስጋ ውስጥ በአይን የሚታይ ስብን በምን ያህል ጊዜ ይበላሉ?	በየቀኑ አንዳንድ ጊዜ በልቼ አላውቅም
3.10	በተለምዶ በቲቪ ፕሮግራሞችን ፣ በቪዲዮ ጌሞች ወይም በኮምፒውተሮች ምን ያህል ጊዜ ያጠፋሉ	<30 ደቂቃ 30-60 ደቂቃ 60-90 ደቂቃ >=120 ደቂቃ
3.11	በተለምዶ ተኝተው የሚያሳልፏቸው ሰዓታት ብዛት	<6 ሰዓት 6-9 ሰዓት >=10 ሰዓት
3.12	ከቤት ወደ ስራ ለመሄድ የምትጠቀመው/ሚው የመጓጓዣ አይነት	የእግር ጉዞ ብስክሌት መኪና

ክፍል አራት፡ የአካላዊ እንቅስቃሴ መጠይቅ

የአካላዊ ተግባራት መጠይቅ

ከዚህ በታች ስለ ግለሰባዊ አካላዊ ተግባራት ደረጃዎች የቀረቡ ጥያቄዎች ናቸው፡፡ እባክዎን ዝርዝሮቹን ያንብቡና ራስዎን ፈጣን ግለሰብ አድርገው ባይቆጥሩም ጥያቄዎቹን ይመልሱ፡፡ ሁሉንም ተግባራት በመመልከት፣ በቤት እና በጓሮ ስራዎች፣ ከቦታ ወደ ቦታ ለመሄድ ፣ እና በትርፍ ጊዜዎ ውስጥ ለመዝናኛ፣ ለእንቅስቃሴ ወይም ለስፖርት የሚሰሯቸውን፡፡

ጠንካራ የአካላዊ ተግባር

ስለ ሁሉም ጠንካራ ተግባራት ከባድ አካላዊ ጥረት ስለሚጠይቁ ባለፉት 7 ቀናት ውስጥ ሰርቱዋቸው ስለነበሩ አካላዊ ተግባራት ብቻ ያስቡ፡፡ ጠንካራ ተግባራት ትንፋሽዎ ከተለመደው በላይ እንዲከብድ እና ከባድ እቃ ማንሳት፣ ኤሮቢክስ ወይም ብስኬሌት ማብረር ሊጨምሩ ይችላሉ፡፡ በአንድ ጊዜ ቢያንስ ለ10 ደቂቃዎች ይሰሩዋቸው የነበሩ አካላዊ ተግባራትን ብቻ ያስቡ፡፡

ቁጥር	ጥያቄዎች	ምርጫዎች
4.0	ባለፉት 7 ቀናት ለምን ያህል ቀናት ጠንካራ አካላዊ ተግባራትን ሰርተው ነበር?	1. _____ ቀናት/በሳምንት 2. አላውቅም/እርግጠኛ አይደለሁም
4.1	በእነዚህ ጠንካራ አካላዊ ተግባራት ከእነዛ ቀናት **በአንዱ** በተለምዶ ምን ያህል ሰዓት በጠቅላላው አጥፍተው ነበር?	_____ ሰዓት/በቀናት _____ደቂቃ/ በቀን

		አላውቅም/እርግጠኛ አይደለሁም
4.2	የተግባርዎ አካሄድ ቀን በቀን የሚለይ ከሆነ፣ ባለፉት 7 ቀናት ጠንካራ አካላዊ ተግባራት በመስራት ምን ያህል ጊዜ **በጠቅላላው** አጥፍተው ነበር?	1._____ ሰዓት/በቀናት 2. _____ደቂቃ/ በቀን አላውቅም/እርግጠኛ አይደለሁም

መካከለኛ አካላዊ ተግባር

ባለፉት 7 ቀናት ውስጥ ሰርቱዋቸው ስለነበሩ መካከለኛ አካላዊ ጥረቶች ያስቡ:: መካከለኛ አካላዊ ተግባራት አተነፋፈስዎን በተወሰነ ደረጃ ከተለመደው የበለጠ አስቸጋሪ ያደርጓቸዋል:: እንዲሁም ቀላላል ጭነቶችን፣ ብስክሌት ለመደበኛ ፍጥነት መንዳት፣ ወይም ጠረጴዛ ቴኒስ መጫወት ሊጨምሩ ይችላሉ:: መራመድ አይጨምርም፣ እንደገና ቢያንስ ለ10 ደቂቃዎች ሰርተዋቸው የነበሩ አካላዊ ተግባራትን ብቻ ያስቡ::

ቁጥር	ጥያቄዎች	ምርጫዎች
4.3	ባለፉት 7 ቀናት ለምን ያህል ቀናት መካከለኛ አካላዊ ተግባራትን ሰርተው ነበር?	_____ ሰዓት/በቀን _____ደቂቃ/ በቀን አላውቅም/እርግጠኛ አይደለሁም
4.4	በእነዚህ መካከለኛ አካላዊ ተግባራት ከእነዛ ቀናት በአንዱ በተለምዶ ምን ያህል ሰዓት በጠቅላላው አጥፍተው ነበር	_____ ሰዓት/በቀን _____ደቂቃ/ በቀን አላውቅም/እርግጠኛ አይደለሁም
4.5	የተግባርዎ አካሄድ ቀን በቀን የሚለይ ከሆነ፣ ባለፉት 7 ቀናት መካከለኛ አካላዊ ተግባራት በመስራት ምን ያህል ጊዜ በጠቅላላው አጥፍተው ነበር	_____ ሰዓት/በቀን _____ደቂቃ/ በቀን አላውቅም/እርግጠኛ አይደለሁም

***መራመድ* (Walking)**

4.6	አሁን ባለፉት 7 ቀናት ውስጥ በመራመድ ስላጠፉዋቸው ጊዜዎች ያስቡ:: እነዚህም በት/ቤት እና በቤትዎ፣ ከቦታ ወደ ቦታ በእግር ለመጓዝ፣ እና ለመዝናኛ፣ ለስፖርት የእንቅስቃሴ ተግባራት ወይም ለመዝናኛ ያደረጉዋቸውን ብቻ ሊጨምሩ ይችላሉ::	1. _____ ቀናት/በሳምንት 2. አላውቅም/እርግጠኛ አይደለሁም
4.7	ባለፉት 7 ቀና ለምን ያህል ቀናት በአንድ ጊዜ ቢያንስ ለ10 ደቂቃዎች ተጉዘው ነበር?	_____ ሰዓት/በቀን _____ደቂቃ/ በቀን አላውቅም/እርግጠኛ አይደለሁም
4.8	የተግባርዎ አካሄድ ቀን በቀን የሚለይ ከሆነ፣ ባለፉት 7 ቀናት በመራመድ ምን ያህል ጊዜ በጠቅላላው አጥፍተው ነበር?	_____ በሰዓት/ቀናት _____በደቂቃ/ በቀን አላውቅም/እርግጠኛ አይደለሁም

***መቀመጥ*(Sitting)**

በመጨረሻ ባለፉት 7 ቀናት በሳምነቱ እረፍት ቀናት በመቀመጥ ያጠፉዋቸውን ጊዜያት ያስቡ:: እነዚህም በትምህርት ክፍል፡ በቤት፣ የትምህርት ስራ ሲሰሩ እና በትርፍ ጊዜዎ ያጠፉትን ሰዓት ይጨምራሉ:: ይህም በዴስክ ላይ፣ ጓደኞችዎን በመጎብኘት፣ ቴሌቭዥን

ለመመልከት ተቀምጠው ወይም ተጋድመው ያጠፉትን ጊዜ ይጨምራል፡፡

4.9 ባለፉት 7 ቀናት በሳምንቱ ቀናት _____ሰዓታት/ሳምንታት
ተቀምጠው ለጠቅላላው ምን ያህል ጊዜ አጥፍተዋል? _____ደቂቃዎች/ሳምንታት
አላውቅም

ክፍል አምስት፡ አንትሮፖሜትሪክ ልኬት

አንትሮፖሜትሪ				
ተ.ቁ		ንባብ 1	ንባብ 2	አማካይ
1	ቁመት	_____	_____	
2	ክብደት	_____	_____	
3.	የወገብ ልኬት	_____	_____	
4.	የደም ግፊት ልኬት	_____	_____	

Declaration

I, the undersigned, declare that this thesis is my original work and has not been presented for a degree in this or another university and all the sources of materials used for the thesis have been fully acknowledged.

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This thesis work has been submitted for examination with my approval as university advisor.
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