Jimma University

Institute of Health

Departement of Biomedical Sciences (Medical Physiology)

Prevalence of Menstrual Cycle Irregularity and Associated Factors among Medical Students of Jimma University, Southwest Ethiopia, 2018

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ABSTRACT

Background*: Menstrual cycle is a normal physiological process that is characterized by periodic and cyclic shedding of progestational endometrium accompanied by loss of blood. Menstrual cycle irregularity is a reproductive disorder occurring among university students and hinders quality of life and academic performance. Even though few researches were conducted on the prevalence of menstrual cycle irregularity among university students in Ethiopia, the associated factors related with irregular menstrual cycle were not studied.*

Objective*: The objective of this study was to determine the prevalence of menstrual cycle irregularity and associated factors among medical students of Jimma University, Southwest Ethiopia, 2018*

Methods*: An institution based cross-sectional study was conducted among 246 female medical students. Stratified sampling with proportional allocation was used to select study participants. A pre tested structured self administered questionnaire was used to collect the data; and weight and height were measured then BMI was calculated. The data were entered in Epi data version 3.1 and analyzed by SPSS Version 20.0. Frequencies, means and proportions were used for the descriptive analysis of data. Bivariable analysis was done to select candidate variables for multivariable logistic regression. Adjusted odds ratio along with 95 % confidence interval was estimated to measure the strength and direction of association. Level of statistical significance was declared at p value less than 0.05.*

Results*: The prevalence of menstrual cycle irregularity was 32.9% (95% CI: 27.2%, 39.8%). The contributing factors remained to be statistically significant were the age group of 18-20 years [AOR =3.01, 95% CI (1.09-8.32)], having psychological distress [AOR =6.53, 95% CI (3.44-12.38)] and overweight [AOR =3.21, 95% CI (1.36-7.58)]*

Conclusion and recommendation*: The prevalence of menstrual cycle irregularity was high among medical students of Jimma University. The age group of 18-20 years, psychological distress and overweight were independent factors associated with menstrual cycle irregularity. The students should be advised to control their body weight and have to be supported by concerned office in the University to minimize the level of stress.*

Key words*: menstrual cycle irregularity, female medical students, body mass index, psychological distress, substance use*

ACKNOWLEDGEMENT

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LIST OF ABBREVIATIONS

ACTH	Adrenocorticotropic Hormone
BMI	Body Mass Index
CGPA	Cumulative Grade Point Average
CI	Confidence Interval
CRH	Corticotrophin Releasing Hormone
ETB	Ethiopian Birr
FSH	Follicle Stimulating Hormone
GnRH	Gonadotropin Releasing Hormone
HPOA	Hypothalamic–Pituitary– Ovarian Axis
HPAA	Hypothalamic–Pituitary– Adrenal Axis
LH	Luteinizing Hormone
SHBG	Sex Hormone Binding Globulin
SPSS	Statistical Package for Social Sciences
SRQ	Self Reporting Questionnaire
WHO	World Health Organization

1. INTRODUCTION

1.1 BACKGROUND

Menstrual cycle is a normal physiological phenomenon from menarche to menopause that is characterized by periodic and cyclic uterine bleeding in response to cyclic hormonal changes once a month accompanied by loss of blood(1).

The menstrual cycle consists of three phases: the menstrual phase; the proliferative phase; and the secretory, or progestational, phase. The first phase of menstrual cycle is the menstrual phase which is characterized by discharge of blood and endometrial debris from the vagina. By convention, the first day of menstruation is considered the start of a new cycle. It coincides with the end of the ovarian luteal phase and onset of a new follicular phase. As the corpus luteum degenerates because fertilization and implantation did not take place the circulating levels of progesterone and estrogen drop precipitously because the net effect of progesterone and estrogen is to prepare the endometrium for implantation of a fertilized ovum. Withdrawal of these steroids deprives the highly vascular, nutrient-rich uterine lining of its hormonal support(2,3).

The second phase is the proliferative phase which begins when the menstrual flow ceases. During this phase the uterus renews itself and prepares for pregnancy. The endometrial tissue that is left after menstruation begins to grow. The endometrial glands grow and enlarge causing more blood vessels. Estrogen promotes uterine changes in this phase(4).

The third phase is secretory phase which is characterized by progesterone-induced differentiation of the endometrial epithelial cells into secretory cells. Toward the end of the secretory phase Estrogen receptors expressed by the endometrial epithelial cells during the proliferative phase are down-regulated by progesterone action, thus attenuating estrogen's proliferative effect. Progesterone converts the thickened, estrogen-primed endometrium to a richly vascularized, glycogen-filled tissue(3,5).

Physiologically menstrual cycle is controlled by the hypothalamic-pituitary-ovarian axis (HPOA).The hypothalamus regulates the menstrual cycle by secreting pulsatile gonadotropin-releasing hormone (GnRH) which controls follicle stimulating hormone (FSH) and luteinizing hormone (LH) from the pituitary gland. Both FSH and LH are required for follicular maturation and ovulation, which assists in maintaining the corpus luteum. Menstrual irregularities can be caused by disturbance of the HPOA by age of menarche, significant weight loss, obesity and severe stressors(2,5).

The initial period of bleeding is called menarche. The first few cycles are usually irregular and anovulatory, as the result of delayed maturation of the positive feedback by estradiol on a hypothalamus that fails to secrete significant GnRH(6).

There are several known mechanisms for the influence of adipose tissue on ovulation and menstrual cycle; adipose tissue converts androgens to estrogen by aromatization in the extra glandular tissues. Body weight influences the direction of estrogen metabolism, with very thin women producing a less potent inactivated form of estrogen and obese women producing more potent forms of estrogen because of activated estrogenic activity. Obese women have diminished capacity for estrogen binding with sex hormone binding globulin (SHBG), which inactivates estrogen and results in an elevated percentage of free serum estradiol. By this mechanism obesity may cause oligomenorrhea through inhibition of HPOA(7)

Under stressful conditions, corticotrophin-releasing hormone (CRH) is released from the hypothalamus, and CRH stimulates adrenocorticotropic hormone (ACTH) from the pituitary gland; then cortisol is secreted from adrenal gland, which is stimulated by ACTH. Cortisol inhibits the release of LH by the pituitary gland and estrogen by the ovaries, leading to interruption of the menstruation cycle(2).

Menstrual irregularities are common in adolescent girls. Periods can be irregular and/or heavy especially in the first few years following menarche. Menstrual irregularities can have a significant effect on daily activities and result in school absence(8,9).

A cross sectional study conducted in Singapore adolescents, 23.1% reported having irregular cycles. Oligomenorrhea was the most frequently reported problem (17.5%), and polymenorrhea was much less prevalent (2.0%)(10).

According to the study done among Egyptian adolescent females 22% had irregular cycles. Oligomenorrhea was found in 14.5%, polymenorrhea in 14%. The mean duration of blood flow is 4 ± 1.5 days. Average blood loss was found in 92%, heavy blood loss in 5%, scanty flow in 3%. Among those adolescents who had irregular menstrual cycle, 25% of them had limited social activities and 10% of them were absent from school (11).

Medical students are at high risk for developing menstrual irregularities due to stressed life style(2). Menstrual irregularity is one of the common problems among adolescent girls particularly girls in their teens or early twenties(12).

1.2 STATEMENT OF THE PROBLEM

Menstrual cycle determines the reproductive health of women. Menstrual irregularities are common gynecological problems in reproductive women and a major source of anxiety to them and their family. It is reported that the prevalence of menstrual irregularity ranges from 10% to 38% in menstruating women(2,13).

A study conducted in Scandinavia showed that 46% of respondents at the second gynecologic year and 33% of respondents with gynecologic age more than 2 years had irregular menstrual cycles(14).

According to the study conducted among young Japanese college students in 2007, 33.3% of respondents had irregular menstrual cycle(15). The prevalence of menstrual cycle irregularity among the schools adolescents of Nepal was 38.7% based on the cross sectional study conducted in 2015(16).

A cross sectional study conducted in Taif Medical College in Saudi Arabia reported that 30% of students were suffering from irregular menstrual cycle and 29.9 % had heavy bleeding(17). Another study conducted in Arabian Gulf University students in Kingdom of Bahrain showed that menstrual irregularity affected their amount of sleep (73.3%), sleep quality (60%), diet (73.8%) and exercise (60.7%). Academic performance was affected as well; study time (76.0%), concentration (65.8%), group activities (58.1%), examination performance (51.8%) and attendance (40.8%)(18).

According to the research done on Bharath University and Sri Ramachandra University in India, 29% and 31.7% of students were affected by irregular menstruation, respectively(9,19).

A study done among school teenagers in rural South Africa 61.63% of the girls reported having irregular periods and 22.68 % of girls did not attend school during their periods(20). According to a cross sectional study conducted among female undergraduates in a federal university in Nigeria, 64.4% students of were absent from school; 63% of them had loss of concentration due to menstrual irregularities(21).

The study done among Bahir Dar university students revealed that menstruation was irregular in 46.2% of the respondents .This study revealed that few (3.8%) of the respondents had menstrual cycle length of shorter than 21 days and the majority (81.3%) of them had between 21 and 35 days, inclusively(22).

Menstrual irregularity frequently affects the quality of life of adolescents and young adult women, such problems also have economic consequences in terms of health care costs due to the consumption of expensive hormonal drugs and laboratory tests. Menstrual irregularity has non-health problems as well, as limitations on attendance at work and school /college which hinder academic achievements and employment prospects(17).

 A few researches were conducted on the prevalence of menstrual cycle irregularity among university students in Ethiopia but the associated factors related with irregular menstrual cycle were not studied. Hence this study investigated the magnitude of menstrual cycle irregularity as well as the associated factors among female medical students in Jimma University.

1.3 SIGNIFICANCE OF THE STUDY

A few studies were done on menstrual cycle irregularity among adolescent university students in Ethiopia. However, the associated factors related with menstrual cycle irregularity had not been investigated. This study investigated the prevalence of menstrual cycle irregularity as well as associated factors. This study will be used as an input for health planners to give special attention to create good quality of life and academic achievement of university students. This study will also help the university community to devise a supportive mechanism for students to alleviate associated factors to menstrual irregularities. Lastly it will add knowledge and importance for succeeding researchers.

2. LITERATURE REVIEW

2.1 MENSTRUAL CYCLE IRREGULARITY

Regular menstrual cycle occurs every 28 ±7 days in which the menstrual flow lasts for 3- 7 days with an average loss of 30-80 ml of blood. Irregular menstrual cycle is any deviation from normal duration. Menorrhagia denotes regular cycles with bleeding either excessive in amount (>80ml) and/or, in duration with flow lasting >7 days. Hypomenorrhea is scanty menstrual flow which lasts for <2 days. In polymenorrhoea, the interval between two consecutive cycles is <21 days and in oligomenorrhea this interval may extend to>35 days(9).

Irregular menstrual cycle is common gynecologic problem among adolescents and young adult women. A study in Pakistan revealed that 24% of respondents had irregular menstrual cycle(23). Another study done among college nursing students in Taiwan 14.1% and 14.6% students had short cycles less than 24 days and long cycles greater than 35 days, respectively(24).

According to the study conducted among nursing students in Saudi Arabia 36.4%, 21.6% and 21.3% of the participants had irregular menstruation, oligomenorrhea and polymenorrhea. Also 6.7% and 9.1% had hypomenorrhea and hypermenorrehea (menorrhagia), respectively. About 19.5% and 12.5% of the participants used less than 3 pads and more than 5 pads per day during menstruation respectively (25).

In the study done in Egypt, it was observed that 8.4% of the respondents continued to have irregular periods beyond the first year after menarche, 17.5% reported having irregular periods only during the first 6-12 months after menarche. (26)

Overweight, lifestyle patterns, and body mass index are related to the cause for the number of cases with menstrual irregularities(12)

2.2 FACTORS ASSOCIATED WITH MENSTRUAL CYCLE IRREGULARITY

2.2.1 SOCIODEMOGRAPHIC AND ECONOMIC FACTORS

Menarche is an important milestone in the development of female adolescent unlike other pubertal changes that are gradual and continuous. It is considered a distinct benchmark for sexual maturation. The average age at menarche ranges from 9-16 years among different population(10,27).

The Korea National Health and Nutrition Examination Survey revealed that subjects with menstrual irregularity had a higher age of menarche (14.0±0.1) as compared to subjects without menstrual irregularity (13.8±0.0)(2).

A study done in Singapore revealed that the prevalence of menstrual irregularity decreased significantly with chronological age; this prevalence was 25.0% between the ages of 12-13 years and decreased to 19.3% after the age of 18 years. The decrease was also seen with increasing gynecological age (years from menarche); the prevalence was 36.2% in the first gynecological year and progressively declined to 19% five years post menarche(10).

According to a cross sectional study conducted in Pakistan the participants who were married had more irregular menstrual cycle than those who were single(28). A study in University of Scandinavia showed that low economic status was a risk for irregular menstrual cycle(14). Another study done in India reported that as the women's income increases, irregular menstruation frequency decreases(29).

2.2.2 BODY MASS INDEX (BMI)

Obesity remains a common and global problem in women of reproductive age. It involves an abnormal and disproportionate body fat accumulation that negatively affects menstrual function. WHO defined obesity as body mass index equals to or greater than 30 kg/m^2. Its prevalence is increasing worldwide and obese women have been shown to have a higher incidence of menstrual dysfunction(30).

Obese individuals often experience disruption of the menstrual cycle and abnormal menstrual flow. In United States survey, the prevalence of menstrual irregularities in obese women has been reported to range between 8% and 18%(12). A study in Japan revealed that students with irregular menstruation showed a significantly higher BMI scores compared with those of students with regular menstruation(15).

According to the study conducted in Pakistan, 75.51% of girls with BMI of 14-24.9 kg/m2 had a normal menstrual pattern and 4% of girls with a BMI of 25 – 29.9 kg/m2 had infrequent cycles (oligomenorrhea)(23).

Another study in Taiwan revealed that students whose BMI was greater than 27 kg /m2 had about 70-fold greater risk for having a long cycle. This factor was also found to be associated with cycle variability(24).

A study done in Singapore adolescents showed that with increasing body mass index , there was a significant increase in the prevalence of oligomenorrhea, whereas polymenorrhea was more prevalent in the girls with a low BMI(10).

A cross-sectional study conducted among medical students in India showed increased BMI was associated with infrequent cycles(9). In Nigeria one study revealed that girls with higher BMI experienced significantly longer menstrual cycle and infrequent cycles compared to their normal weight counterparts(31).

Research in Egypt showed there was a statistically significant relation between the BMI and the menstrual cycle rhythm; the highest prevalence of irregular menstruation was in obese (65.9%) and overweight students (51.4%), while the least was in normal weight students affecting 41.7% of them(32).

2.2.3 PSYCHOLOGICAL DISTRESS

The presence of irregular menstruation was more common in female students with loneliness, guilt, self-dislike, suicidal thoughts and dissatisfaction with life, but also with anorexia and weight loss. The irregularity of menstrual cycles among teenaged females is associated with a

number of indices reflecting psychosocial distress. Thus, cycle irregularity in adolescent females appears to be one indicator of the general distress and poor adaptability in daily life.(14).

Menstrual function is regulated by a hypothalamic gonadotropin releasing hormone that can be inhibited by the hypothalamic–pituitary– adrenal (HPA) axis in response to stress. A study among adolescent Korean girls revealed that subjects with high stress levels were more likely to have menstrual cycle irregularity(33).

According to a study done in Saudi Arabia the prevalence of menstrual changes is high among students during exams. They experience earlier menstruation and an increase in menstrual blood flow(34). A study in Taiwan showed that psychiatric stress was associated with cycle variability and duration of bleeding (24).

Problems within the family and at school may also be stress factors of importance for menstrual disturbances in young girls. In a study conducted in Sweden revealed that about 53% of oligomenorrheic girls reported problems within the family like death among family members, lost contact with one or both parents, parents with psychiatric diseases, and severe and protracted conflicts within the family(35).

A research conducted among medical students in India revealed that stress during the examination was associated with increased prevalence of irregular cycles (9). Another study in Nigeria reported that menorrhagia(37.5%) and oligomenorrhea(19.9%) were highly prevalent menstrual problems during examination (36).

2.2.4 SUBSTANCE USE

Several studies described that substance use was one risk factor for irregular menstrual cycle. According to the cross sectional study conducted in Pakistan women who were ever user of nicotine had about five times more risk to have irregular menstrual cycle than non users.(28).

A study done in Korea demonstrated that women who started smoking earlier than 19 years of age or who smoked >10 cigarettes per day had a significantly increased risk of menstrual

irregularity(37). Similarly another study in Korea revealed that the current smokers had 1.4 times more likely to have menstrual cycle irregularity than non-smokers(33).

There were controvesies about the effect of alcohol consumption on menstrual cycle. Sarkar RN reported that alcohol intake increases estradiol levels in humans and in rodents. The elevated estradiol level may in part explain the negative effect of alcohol on menstrual cycle and on its irregularity. Long-term moderate alcohol consumption was also shown to decrease ovarian reserve(38). However, a study conducted among adult women in Korea revealed that the association between alcohol consumption and menstrual cycle irregularity was not found to be statistically significant(39).

2.3 CONCEPTUAL FRAME WORK
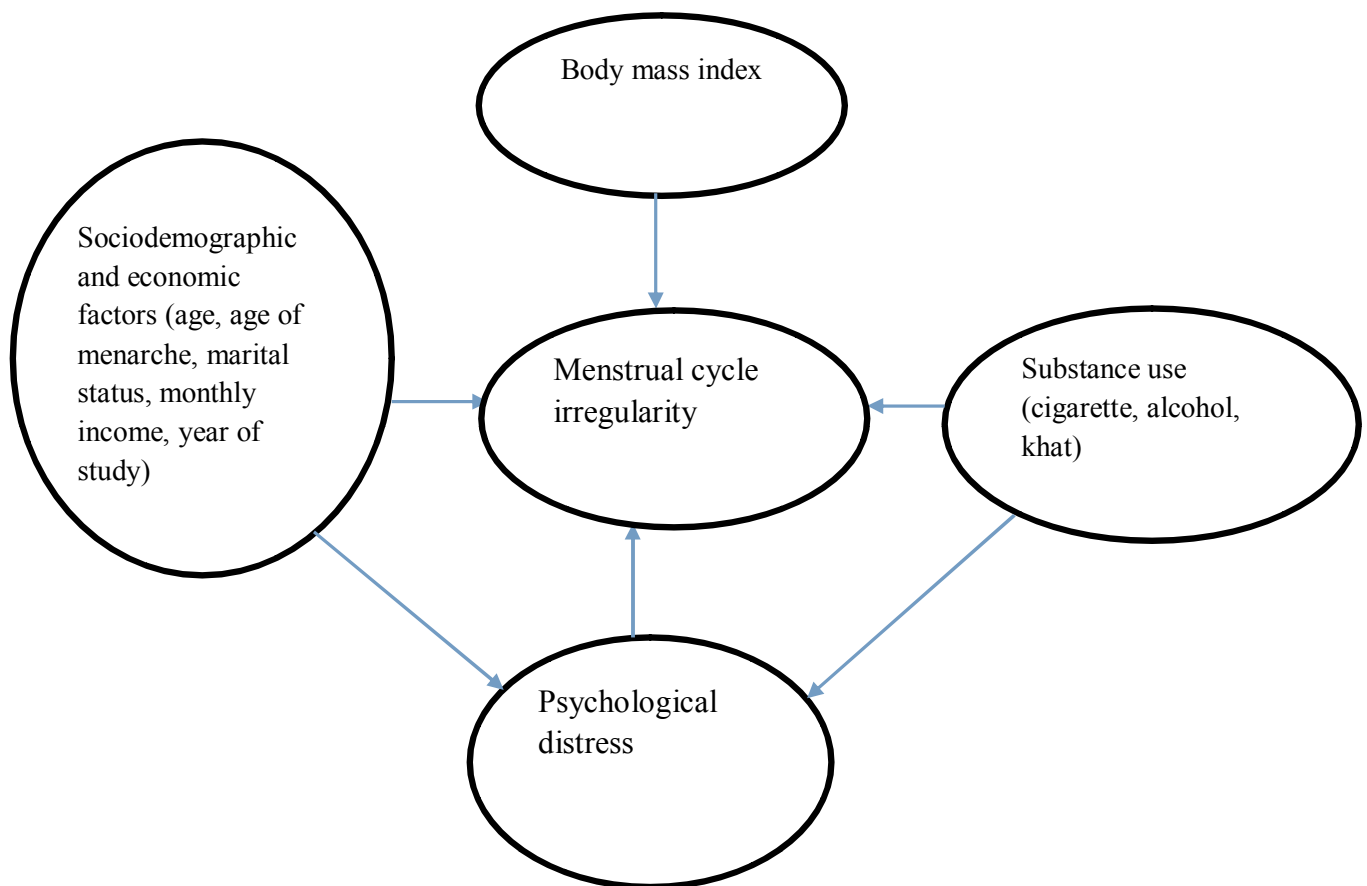
Figure 1: Conceptual Frame Work for Menstrual Cycle Irregularity and Associated Factors

3. OBJECTIVES

3.1 GENERAL OBJECTIVE

The main objective of this study was to determine the prevalence of menstrual cycle irregularity and associated factors among medical students of Jimma University, Southwest Ethiopia, 2018

3.2 SPECIFIC OBJECTIVES

1. To determine the prevalence of menstrual cycle irregularity among medical students of Jimma University
2. To determine the association between menstrual cycle irregularity and socio-demographic characteristics among medical students of Jimma University
3. To investigate the relationship between menstrual cycle irregularity and body mass index among medical students of Jimma University
4. To determine the association between menstrual cycle irregularity and psychological stress among medical students of Jimma University
5. To investigate the relationship between menstrual cycle irregularity and substance use among medical students of Jimma University

4. MATERIALS AND METHODS

4.1 STUDY MATERIALS

Self administered structured questionnaire, weighing machine and meter tape were employed resources during data collection.

4.2 STUDY AREA AND PERIOD

The study was conducted at Jimma University, Oromia Regional State, Ethiopia from April 05 to May 05, 2018 in Jimma town which is located 352 kilometers Southwest of Addis Ababa, Ethiopia. School of Medicine under the Institute of Health is found in the main campus of Jimma University that consists of 1705 undergraduate medical students. Out of 1705 students 531 are females in the study year.

4.3 STUDY DESIGN

Institution based cross-sectional study was employed to determine the prevalence of menstrual cycle irregularity and associated factors among medical students of Jimma University.

4.4 POPULATION

4.4.1 SOURCE POPULATION

All female medical students of Jimma University in 2018

4.4.2 STUDY POPULATION

Sampled undergraduate female medical students of Jimma University enrolled during the study period

4.5 ELIGIBILITY CRITERIA

4.5.1 INCLUSION CRITERIA

Undergraduate female medical students of Jimma University at reproductive age who had started menstruation were included in the study.

4.5.2 EXCLUSION CRITERIA

- Medical students who were pregnant
- Students who were on hormonal family planning methods

4.6 SAMPLE SIZE

The sample size was calculated using single population proportion formula by assuming the proportion of menstrual cycle irregularity in Bahir Dar University which was 46.2%(22) with confidence of 95%, margin of error 5%, and non-response rate of 10% were taken. The sample size was calculated using the following single proportion formula:

$n = (Z_{\alpha/2})^2 P (1-P) /d^2$

Where:

n = Sample size

P = prevalence of menstrual cycle irregularity among Bahir Dar university students = 46 .2%

Z = Percentiles of the standard normal distribution corresponding to 95 % confidence level assumption

d = Margin of error=0.05

$Z_{\alpha/2}$ = Coefficient at level of significance = 1.96

Non response rate = 10%

The calculated sample size was 382 and the population is less than 10,000 apply the population correction formula.

$n_f = n/ (1+n/N)$

Where: n_f = final sample size

n = sample size

N = total population

The calculated final sample size was 223 and 10% (23) of the sample size was added for non- response rate that gives a total of 246.

4.7 SAMPLING TECHNIQUE AND SAMPLING PROCEDURES

Stratified sampling with proportional allocation was used to select the study subjects from school of `medicine; undergraduate female medical students who were in the campus during the time of study. The students were classified into six years of study (batches) and proportional size was selected from each batch. The study participants from each batch were selected by simple random sampling through lottery method. The students' list was obtained from Jimma University Institute of Health Registrar Office.

Year of study and sample size selected:

Year I (64) = 30	Year IV (96) = 44
Year II (94) = 44	Year V (76) = 35
Year III (139) = 64	Year VI (62) = 29

Total = 246

4.8 DATA COLLECTION PROCEDURES (INSTRUMENT, PERSONNEL, DATA COLLECTION TECHNIQUE)

Data were collected using a pre-tested, structured, self-administered questionnaire developed by reviewing relevant literatures(7,10,15,21,34,35); standard questionnaire used previously in similar studies; and a standardized weight and height measurement tools. The questionnaire had five parts. The first was a structured questionnaire which includes the sociodemographic characteristics of the students; the second tool was a standardized menstrual cycle questionnaire which could assess the menstrual cycle characteristics; the third part was standardized Self Reporting Questionnaire 20(SRQ-20) which assesses psychological distress; the fourth part had

questions related to substance use. The last part was the physical measurement sheet that entails the physical assessment data, in terms of height, weight, and BMI. Weight and height of participants were measured without shoes. From the measured weight (kg) and height (m) BMI (kg/m^2) was computed; then the values were approximated into the tenth digit and recorded on a prepared physical measurement sheet. Four data collectors and two supervisors from B.Sc. nurses were recruited and trained by the principal investigator. The questionnaire was pre tested on 25 medical students in Wolkite University. The questionnaire was prepared in English version.

4.9 STUDY VARIABLES

4.9.1 DEPENDENT VARIABLE

- Menstrual cycle irregularity

4.9.2 INDEPENDENT VARIABLES

- Age
- Marital status
- Ethnicity
- Religion
- Mothers educational status
- Average monthly income
- Year of study
- CGPA
- Age of menarche
- BMI
- Psychological distress
- Substance use(smoking, alcohol intake, chat chewing)

4.10 OPERATIONAL DEFINITIONS

- Irregular Menstrual cycle: when the menstrual cycle length is less than 21 days or more than 35 days

- Minimal menstrual flow: when a woman using less than 2 pads/day during menstrual period

- Moderate menstrual flow: when a woman using 2-4 pads/day during menstrual period

- Heavy menstrual flow: when a woman using more than 4 pads/day during menstrual period(25).

- Psychological distress : students who have 8 or more symptoms out of the 20 SRQ-20 in the last 4 weeks(40).

- No psychological distress : students who have 7 or less symptoms out of the 20 SRQ-20 in the last 4 weeks(40)

- Substance use: use of one or more psycho-stimulant drugs (cigarette, alcohol, khat)

- Body mass index
  - Underweight- a person having BMI of <18.5 Kg/m^2
  - Normal weight -a person having BMI of 18.5-24.9 Kg/m^2
  - Overweight- a person having BMI of 25 -29.9 Kg/m^2
  - Obese- a person having BMI $\geq$ 30 Kg/m^2(30).

4.11 DATA ANALYSIS PROCEDURES

The collected data were checked for their completeness and coded. After that the data entered to Epi data version 3.1 then exported to SPSS version 20.0 for analysis. Frequencies, means and proportions were used for the descriptive analysis of data. Bivariable analysis was done to select candidate variables. Variables in bivariable analysis those had a p-value <0.25 entered into multivariable logistic regression then odds ratio was calculated for the associated variables at confidence interval of 95% and P-value < 0.05 was considered statistically significant.

4.12 DATA QUALITY MANAGEMENT

A pre tested tool was used and training was given to data collectors regarding purpose of the study and measurement techniques (weight, height and BMI). Individual records were put on a

prepared questionnaire format. Then the collected data were checked for completeness and consistency, categorized, and a specific code was given for each variable by the supervisors and principal investigator.

4.13 ETHICAL CONSIDERATION

Ethical clearance was obtained from the Institutional Review Board of Jimma University. Permission letter was obtained from School of Medicine of Jimma University. Informed written consent was obtained from the study participants to start data collection. The respondents were assured that their responses would remain confidential.

4.14 DISSEMINATION PLAN

The Finding of this study will be submitted to Department of Biomedical Sciences and shall be presented to Jimma University community as a part of master's thesis. It will be also published on international scientific journals and presented on workshops and symposia at the scientific community.

5. RESULT

5.1 SOCIODEMOGRAPHIC CHARACTERISTICS

A total of 246 participants were recruited in this study, making it 100 % response rate. The mean age of the study participants was 21.54 ± 1.7 years. Out of all respondents 58.5% and 25.2% were Orthodox and Protestant religion followers, respectively. Regarding ethnicity, Oromo accounts for 41.1% and Amhara accounts for 34.1% from all respondents. Most (97.6%) of them were single in marital status; and 91.9% of their parents live together as shown on table 1.

Concerning respondents' mothers educational status, most of them 137 (55.7%) attended college/university and 54(22.0%) completed secondary education. The average CGPA of the participants was 3.27± 0.36. The average monthly income of the respondents was 1242.3 ± 966 ETB (table 1).

Table 1: Sociodemographic Characteristics of Female Medical Students, Jimma University, 2018

Variables	n =246	Frequency	Percent
Age			
18-20 years		63	25.6
21-23 years		147	59.8
24-25 years		36	14.6
Religion			
Orthodox		144	58.5
Protestant		62	25.2
Muslim		32	13.0
Catholic		7	2.8
Adventist		1	0.4

Ethnicity

Oromo	101	41.1
Amhara	84	34.1
Gurage	24	9.8
Tigray	15	6.1
Yem	10	4.1
Dawro	7	2.8
Others*	5	2.0

Marital status

Single	240	97.6
Married	4	1.6
Divorced	2	0.8

Family status

Parents live together	226	91.9
Divorced parents	15	6.1
Other**	5	2.0

Respondent's mothers educational status

No formal education	28	11.3
Primary school	27	11.0
High school	54	22.0
Collage/University	137	55.7

Respondent's monthly income (ETB)

≤ 1000	180	73.2
>1000	66	26.8

Year of study

Year I-III	138	56.1
Year IV-VI	108	43.9

Others* - Walayta, Gumuz, Sidama

Other**- Father or mother /both of them died

5.2 PATTERNS OF MENSTRUAL CYCLE

In this study the mean age of menarche was 13.37 ± 1.45 years. Out of 246 respondents 81 (32.9%) had irregular menstrual cycle. From those who had menstrual cycle irregularity 61(24.8%) and 20(8.1%) experienced oligomenorhea and polymenorrhea respectively. The study finding revealed that the mean duration of menstrual blood flow was 4.75 ± 1.22 days and 8.5% respondents had hypermenorrehea where as 6.5% of them had hypomenorrhea (table 2).

Table 2: Menstrual Cycle Patterns among Medical Students, Jimma University, 2018

Variables n =246	Frequency	Percent
Age of menarche		
10-13 years	138	56.1
≥14 years	108	43.9
Duration of menstrual flow		
2- 7 days	245	99.6
8- 9 days	1	0.4
Number of pads used per day		
1 pad/day	16	6.5
2-4 pads/day	209	85
5-9 pads/day	21	8.5
Frequency of menstrual cycle		
<21 days	20	8.1
21- 35 days	165	67.1
>35 days	61	24.8
Regularity of menstrual cycle		
Regular cycle	165	67.1
Irregular cycle	81	32.9

5.3 BODY MASS INDEX

Height and weight of respondents were measured and body mass index was calculated. About 33(13.4%) participants were overweight as shown in figure 2.
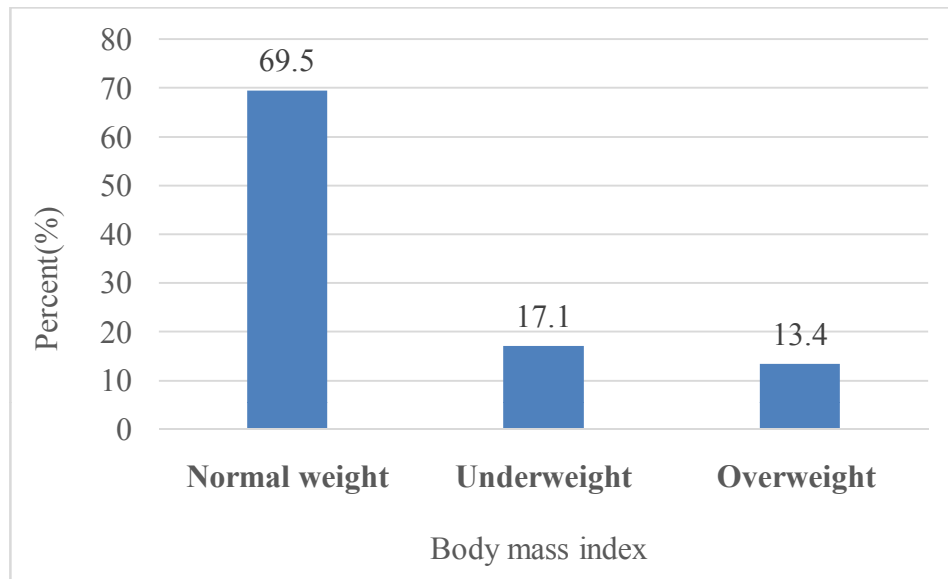
Figure 2 : Body Mass Index among Female Medical Students , Jimma University ,2018

5.4 PSYCHOLOGICAL DISTRESS

Out of the total respondents 73 (29.7%) of them experienced psychological distress according to the standardized SRQ-20 [Figure 3].
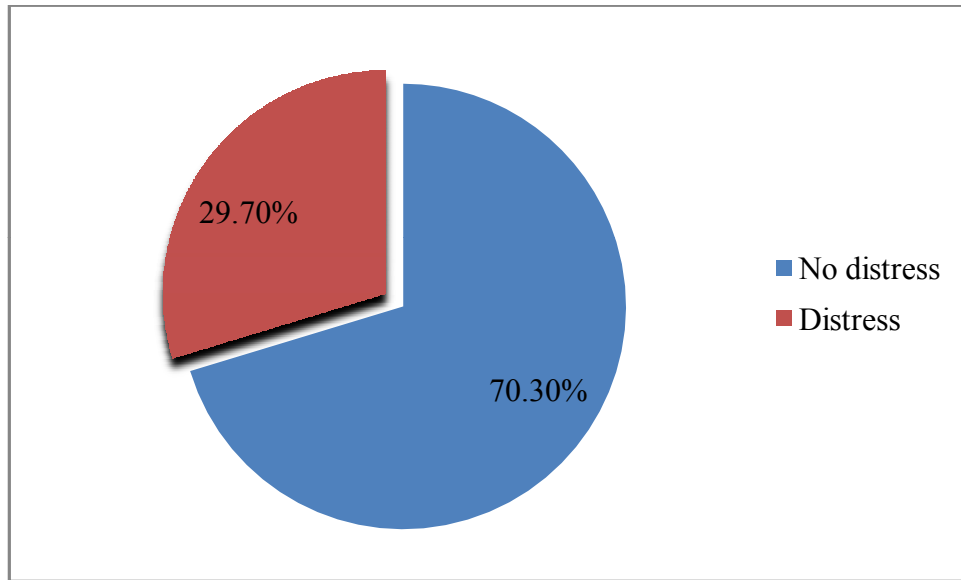
Figure 3: Status of Psychological Distress among Female Medical Students, Jimma University, 2018

5.5 SUBSTANCE USE

From the total respondents 28% of them had a history of drinking alcohol. Among those who had drunk alcohol 60% of them took beer as shown on table 3. In this study none of the respondents had chewed khat or smoked cigarette.

Table 3: Alcohol Consumption among Female Medical Students, Jimma, 2018

Variables	Category	Frequency	Percent
Ever drinking alcohol (n=246)	No	177	72.0
	Yes	69	28.0
Alcohol drinking in the past	No	9	13.0
30 days (n=69)	Yes	60	87.0
Type of alcohol (n=60)	Beer	36	60.0
	Wine	22	36.7
	Tella	2	3.3
Frequency of drinking (n=60)	Monthly or less	54	90.0
	Weekly	5	8.3
	Daily	1	1.7

5.6 FACTORS ASSOCIATED WITH MENSTRUAL CYCLE IRREGULARITY

Initially all variables were considered to be possibly associated with menstrual cycle irregularity; bivariable logistic regression found seven variables which had p value less than 0.25. Age of respondents, mothers' educational status, year of study, age of menarche, body mass index, psychological distress and alcohol consumption were identified as candidate variables for multivariable logistic regression ($p < 0.25$) as shown in table 4.

5.7 FACTORS INDEPENDENTLY ASSOCIATED WITH MENSTRUAL CYCLE IRREGULARITY

All variables that had p value < 0.25 in the bivariable logistic regression analysis were included in the multivariable analysis for backward logistic regression. Multivariable logistic regression analysis revealed that age, body mass index and psychological distress were independent variables that became statistically significant at the level of $p < 0.05$(table 5).

In this study the age category of 18-20 years were about three times [AOR =3.01, 95% CI (1.09-8.32), p =0.033] more likely to experience irregular menstrual cycle than those age group of 24-25 years. Similarly those participants who were overweight (BMI =25- 29.9 kg/m^2) had 3.2 times more likely [AOR =3.21, 95% CI (1.36-7.58), p =0.008] to have more menstrual cycle irregularity as compared to those who were normal weight (BMI =18.5 – 24.9kg/m^2). Finally Participants who had psychological distress were 6.5 times [6.53, 95% CI (3.44-12.38), p < 0.001] more likely to experience irregular menstrual cycle than those who had no psychological distress. In this study other variables such as mothers' educational status, study year, age of menarche and life time drinking of alcohol were not statistically significant (table 5).

Table 4: Factors Associated with Menstrual Cycle Irregularity among Medical Students, Jimma University, 2018

Variables	categories	Number (%)	Regular Menstrual cycle	Irregular menstrual cycle	P value	COR (95% of CI)
Age	24-25 years	36(14.6)	27(16.4)	9(11.1)		1.0
	21-23 years	147(59.8)	105(63.6)	42(51.9)	0.669	1.20(0.52-2.77)
	18-20 years	63(25.6)	33(20.0)	30(37.0)	0.029	2.73(1.11-6.72)
Mother's Educational Status	No formal Education	28(11.4)	20(12.1)	8(9.9)		1.0
	Primary school	27(11)	15(9.1)	12(14.8)	0.467	0.72(0.3-1.08)
	High school	54(22)	42(25.5)	12(14.8)	0.395	1.44(0.62-3.31)
	Collage/university	137(55.7)	88(53.3)	49(60.5)	0.073	0.51(0.25-1.07)
Year of study	Year IV-VI	108(43.9)	79(47.9)	29(35.8)		1.0
	Year I-III	138(56.1)	86(52.1)	52(64.2)	0.074	1.65(0.95-2.85)
Age of menarche	10-13years	138(56.1)	98(59.4)	40(49.4)		1.0
	≥14 years	108(43.9)	67(40.6)	41(50.6)	0.138	1.50(0.88-2.56)
Psychological distress	Have no distress	173(70.3)	137(83)	36(44.4)		1.0
	Have distress	73(29.7)	28(17)	45(55.6)	<0.001	6.12(3.36-11.12)
Alcohol consumption	No	177(72)	124(75.2)	53(65.4)		1.0
	Yes	69(28)	41(24.8)	28(34.6)	0.112	1.6(0.90-2.85)
Body mass index	Normal weight	171(69.5)	126(76.4)	45(55.5)		1.0
	Under weight	42(17.1)	25(15.1)	17(21)	0.073	1.90(0.94-3.85)
	Over weight	33(13.4)	14(8.5)	19(23.5)	0.001	3.80(1.76-8.21)

Table 5: Independent Variables Associated with Menstrual Cycle Irregularity among Medical Students, Jimma University, 2018

Variables	Categories	Total n (%)	Bivariate result		Multivariate result	
			COR (95% CI)	P value	AOR(95% CI)	P value
Age	24-25 years	36(14.6)	1.0		1.0	
	21-23 years	147(59.8)	1.20(0.52-2.77)	0.669	0.968(0.38-2.49)	0.946
	18-20 years	63(25.6)	2.73(1.11-6.72)	0.029	3.01(1.09- 8.32)	0.033*
Psychological Distress	No	173(70.3)	1.0		1.0	
	yes	73(29.7)	6.12(3.36-11.12)	< 0.001	6.53(3.44-12.38)	<0.001*
Body mass index	Normal weight	171(69.5)	1.0		1.0	
	Under weight	42(17.1)	1.90(0.94-3.38)	0.073	1.82(0.84-3.96)	0.132
	Over weight	33(13.4)	3.8(1.76-8.21)	0.001	3.21(1.36-7.58)	0.008*

*statistically significant at P value <0.05

6. DISCUSSION

This institution based cross sectional study is the first study done on menstrual cycle irregularity and its associated factors among medical students in Jimma University. The study revealed that 32.9 % of female medical students experienced irregular menstrual cycle. This finding is in agreement with previous studies conducted in India (Sri Ramachandra University), Saudi Arabia, Scandinavia, Nepal and Japan(15–18,20). However, studies in Ethiopia (Bahir Dar University) and Rural South Africa(21,23) reported higher prevalence of menstrual cycle irregularity. Other studies conducted in Egypt, Pakistan and Singapore(11,12,25) reported lower prevalence of the problem. These variations might be due to the age range of the respondents and level of stress. In early age after menarche especially within the first two years menstruation becomes highly irregular because HPOA is not well developed during that period to control the periodic cycle. This may elevate the magnitude of menstrual cycle irregularity. On the other hand, stressful conditions may evoke HPAA which hinder the activities of HPOA that may also increase the prevalence.

In this study, age was an important predictor for the prevalence of menstrual cycle irregularity. It was found that those respondents in the age group of 18-20 years were about three times more likely to have irregular menstrual cycle compared to the age group of 24-25 years. This was supported by a study done in Singapore(11) in which the prevalence of menstrual cycle irregularity was significantly lower with chronological age. This could be the hypothalamic pituitary ovarian axis which is not matured enough in early age to regulate the release of steroid hormones that are highly responsible for controlling menstrual cycle.

Body mass index was also another significant predictor for menstrual cycle irregularity. This study found that overweight participants were about three times more risky for menstrual cycle irregularity compared to those who were of normal weight. This finding is consistent with other studies conducted among high school students in Egypt, high school and medical students in Nigeria, adolescent girls in Pakistan and Singapore(11,22,24,33). There are several known mechanisms for the influence of adipose tissue on ovulation and menstrual cycle; adipose tissue converts androgens to estrogen by aromatization in the extra glandular tissues. Obese women

have diminished capacity for estrogen binding with SHBG, which inactivates estrogen and results in an elevated percentage of free serum estradiol. By this mechanism obesity may cause oligomenorrhea through inhibition of HPOA(7,41). High BMI may influence the level and equilibrium of endogenous hormones required for optimal menstrual function, thus resulting in irregular menstrual patterns(7,41).

There was also independent and statistically significant association between psychological distress and the odds of menstrual cycle irregularity among female medical students. Those students who had psychological distress were about seven times more likely to have irregular menstrual cycle compared to students who had no psychological distress. This finding was consistent with a study undertaken in Korea which reported that subjects with high stress levels were more likely to have menstrual cycle irregularity(33).This finding is also supported by a study among college nursing students in Taiwan(24). The reason may be menstrual function is regulated by a hypothalamic gonadotropin releasing hormone that can be inhibited by the HPA axis, in response to stress; and in turn, glucocorticoids have reciprocal interactions with ovarian hormones which influence a woman's menstrual cycle regulation(24).

The Korea National Health and Nutrition Examination Survey revealed that subjects with menstrual irregularity had a higher age of menarche as compared to subjects without menstrual irregularity(2). However, in this study there was no significant association between age of menarche and menstrual cycle irregularity. It may be due to variation in socioeconomic status and age of study participants. This study also revealed that there was no significant statistical association between alcohol consumption and the odds of menstrual cycle irregularity which is in agreement with prior findings among adult women in Korea(40). Contradicted to this study Sarkar RN et.al reported that alcohol consumption could affect menstrual cycle(39). It requires further study.

7. LIMITATIONS OF THE STUDY

In this study some limitations may be assumed to occur even though the standardized and validated self administered questionnaires were incorporated. The first one is during data collection period some students were highly congested due to continuous lecture time and clinical practice and the others were relaxed in their year break time. The condition may affect the outcome but this situation was not considered as significant factor in the study. The second limitation is as a cross sectional study it could not infer strong cause effect association between menstrual cycle irregularity and its predictors.

8. CONCLUSION

The prevalence of menstrual cycle irregularity was high among medical students of Jimma University. Generally this study investigated that being age of 18-20 years, the presence of psychological distress and overweight were contributing factors for the presence of menstrual cycle irregularity. In this study, age of menarche and alcohol consumption were not significantly associated with menstrual cycle irregularity.

9. RECOMMENDATIONS

Female medical students should be advised to balance their body. The students also should be advised to reduce stressful conditions for minimizing the future risk of menstrual cycle irregularity. The University should give special attention to female medical students to reduce menstrual cycle irregularities related to psychological distress by providing counseling services to alleviate stress. The University should also support those students having menstrual cycle irregularity to consult a physician. The government should design an intervention plan for those students having psychological distress and menstrual cycle irregularity.

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11. ANNEXES

7.1 Structured Questionnaire for Menstrual Cycle Irregularity and Associated Factors

Jimma University Institute of Health Department of Biomedical Science

Informed consent form

Dear Student: please read this consent document carefully before you decide to participate in this study.

I am Kefale Metku a postgraduate Student in Jimma University Institute of Health; I am going to conduct research on the menstrual cycle irregularity and associated factors and requesting your participation in a research study at Jimma University. This study concerns how do different factors affect menstrual cycle and it's relation to your academic performance. There is no direct benefit to you from taking part in this study. It is hoped that the research will help individuals and policy-makers understand what is important for managing the changes occurring in life that can be related to menstrual cycle irregularity. I want to assure you that, the information that I will obtain using this questionnaire will be used only for research purpose and also your identity will be kept confidential to the extent provided by law. Your information will have a code number. The results of this research study may be published but your name or identity will not be revealed. The study has no risk to you. Participation in research is completely voluntary and you have the right to decline to participate or to withdraw at any point in this study, but your input has great value for the success of the study objective. Therefore, I politely request your cooperation to respond to the questionnaire. If you have any questions about your rights as a participant in this research or any concerns you may contact the data collector.

Do you agree to participate? A. Yes   B. No

If your answer is yes continue with the questionnaire.

 Date of data collection: _____

Name of data collector: _____Signature _____

Participant's code: _____
Thank you for your time and cooperation!

Note: Dear students don't fill the questionnaire if you have one of the following.

1. If you have never started menstruation still now.

2. If you are pregnant.

3. If you have using hormonal contraceptive.

Part- One: Sociodemographic characteristics.

Instruction 1: Please answer all the questions that follow. Fill the blank space or encircle the response where indicated.

101. Age (in years) _____

102. What is your Religion   A. Orthodox B. Catholic C. Protestant D. Muslim

 E. other (specify) _____

103. Ethnicity   A. Oromo   B. Amhara   C. Dawro   D. Gurage   E. Tigray   F. Other

(Specify)_____

104. Marital status   A. Single   B. Married   C. Divorced   D. Widowed

105. Family status (how are your parents living)?

A. Family live together   B. Divorced family   C. If other (specify) _____

106. Mother's educational status

A. No formal education   B. Primary school   C. High school   D. Collage/University

107. Average monthly income of your family (in birr) _____

108. Your average monthly income (in birr) _____

109. Year of study A. 1st Year   B. 2nd Year   C. 3rd Year   D. 4th Year   E. 5th Year   F. 6th Year

110. Your cumulative GPA? _____

111. ID No. _____

Part Two: Menstrual Cycle Questionnaire

Instruction 2: Please answer all the questions that follow.

201. At what age did you have your first menstruation (Age of menarche)? _____

202. On the average, how long is your monthly cycle? (Between two consecutive menses)_____

203. How long your menstruation does flow? (Duration of menstrual flow)_____

204. How many pads have you used per day during your menstrual flow? _____

Part Three: Assessment of Psychological Distress (SRQ-20)

Instruction 3: For the following questions put "X" mark based on your choice on yes or no columns. Please answer all questions.

No	Health problems encountered within the **last 4 weeks**	yes	no
301	Do you often have headache?		
302	Is your appetite poor?		
303	Do you sleep badly?		
304	Are you easily frightened?		
305	Do your hands shake?		
306	Do you feel nervous, tense or worried?		
307	Do you feel heaviness of stomach after meal?		
308	Do you have trouble thinking clearly?		
309	Do you feel unhappy?		
310	Do you cry more than usual?		
311	Do you find it difficult to enjoy your daily activities?		
312	Do you find it difficult to make decisions?		
313	Do you find it difficult to perform daily task?		
314	Are you unable to play a useful part in life?		
315	Do you have loss of interest in things?		
316	Do you feel that you are a worthless person?		
317	Has the thought of ending your life been on your mind?		
318	Do you feel tired all the time?		
319	Do you have uncomfortable feelings in your abdomen?		
320	Are you easily tired?		

Part Four: Substance Use

Instruction 4: The following questions are related with factors that can affect your menstrual cycle. Please answer all questions.

401. Have you ever drunk Alcoholic beverages?   A. Yes   B. No

  If your answer is No skip to Q. no.405

402. If your answer to question number 401 is yes have you used it in the past 30 days?

A. Yes   B. No

403. If your answer to question number 402 is yes what type of alcohol have you drunk?

A. Beer   B. Wine   C. Tella   D. Areki   E. others (specify) _____

404. If your answer to question number 402 is yes how often have you drunk?

A. Monthly or less   B. Weekly   C. Daily or almost daily

405. Have you ever smoked Cigarette? A. Yes   B. No   **If your answer is No skip to Q. no.409**

406. If your answer to question number 405 is yes have you smoked it in the past 30 days?

A. Yes   B. No

407. If your answer to question number 406 is yes how often have you smoked?

A. Monthly or less   B. Weekly   C. Daily or almost daily

408. How many cigarettes did you smoke per day? _____

409. Have you ever chewed khat? A. Yes   B. No   **If your answer is No skip to Q. no.413**

410. If your answer to question number 409 is yes have you chewed it in the past 30 days?

A. Yes   B. No

411. If your answer to question number 410 is yes how often have you chewed?

A. Monthly or less   B. Weekly   C. Daily or almost daily

412. How many grams of chat did you chew per day? _____

413. Have you used other substance in the past 30 days? A. Yes   B. No

414. If your answer to question number 413 is yes what type of substance have you used? (Specify)_____

415. If your answer to question number 413 is yes how often have you used the substance?

A. Monthly or less   B. Weekly   C. Daily or almost daily.

Part Five: Physical Measurement (filled by data collector)

501. Weight in kilogram_____

502. Height in meter_____

503. Body Mass Index in kg/m^2_____

THANK YOU!

DECLARATION

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

Name of the student: Kefale Metku

Signature: _____

Name of the institution: Jimma University

Date of submission: _____

This thesis has been submitted for examination with my approval as University advisor

Name and Signature of the first advisor

_____

_____

Name and Signature of the second advisor

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Name and Signature of the third advisor

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Name and Signature of the external examiner

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Name and Signature of the internal examiner

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