

# Prevalence of weight cycling and the associated

## factors among women aged 25-64 years in the

## **Ramallah and al-Bireh Governorate**

مدى انتشار التغير المستمر في الوزن والعوامل المرتبطة به بين النساء اللواتي أعمار هن بين 64-64 سنة في محافظة رام الله والبيرة

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**Birzeit University – Palestine** 

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## PREFACE

Recently, weight-cycling concern has been raised quite a lot by women around me and by my nutrition clinic female clients. This has inspired me to choose this topic for my dissertation. So when I was given the option to study the prevalence of weight cycling and the associated factors among women in the Ramallah and al-Bireh Governorate; as a topic for my thesis, I gratefully accepted it.

As a global health issue; the impact of weight cycling came from the potential physical and mental health consequences it could have. Some researchers have shown that weight cycling may be worse than being overweight or obese. This highlights the importance of exploring the prevalence of weight cycling among Palestinian women, and the consideration should be given to the interventions provided by professionals to avoid or reduce weight cycling frequencies.

I was particularly pleased to have this opportunity and encouragement from the Institute of Community and Public Health (ICPH) at Birzeit University. This helped me explore the prevalence of weight cycling among women in the Ramallah and al –Bireh Governorate.

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Completing this research would be much difficult without my family support; my husband and my daughters, my parents and my sisters – Thank you for your support and for being patient through my ups and downs.

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## ABBREVIATIONS

BMI	Body Mass Index
COPD	Chronic Obstructive Pulmonary Diseases
CVD	Cardio Vascular Diseases
EMR	Eastern Mediterranean Region
GBD	Global Burden of Disease
МОН	Ministry of Health
NHLBI	National Heart Lung and Blood Institute
Opt	occupied Palestinian territory
OR	Odds Ratio
P-value	Probability value
SE	Standard Error
WC	Waist Circumference
WHR	Waist to Hip Ratio
WHO	World Health Organization

## ABSTRACT

**Background:** In many developed and developing countries, including Palestine, the prevalence of obesity has increased over the last decades. As a result, the number of women trying to lose weight and start dieting has also increased. Failure to meet weight loss goals is common and leads to weight regain and diet restart. This ends with weight cycling that is shown to have physical and psychological negative consequences.

In Palestine, the prevalence of overweight and obesity in all age groups and in both genders is growing. Also, some studies suggested that unhealthy dieting behaviors that lead to weight cycling were common among the young age group. We are witnessing a lack of knowledge on the prevalence of weight cycling and the related factors.

**Aims:** The current study aimed to estimate the prevalence of weight cycling and the associated factors among a sample of women in the Ramallah and al-Bireh Governorate.

**Methodology:** The current study was a cross-sectional study conducted among 384 women aged 25-64 years in the Ramallah and al-Bireh Governorate. The study took place between August and October 2019. Four non- governmental medical centers selected. The participants in the selected centers invited to take part in the study by filling the questionnaire. The study questionnaire consisted of five sections that all of them validated in the Arab context except for weight cycling questions that piloted and back-translated. The main outcome of this study was weight cycling. Univariate analysis described the means and proportions of

the study variables. Chi-square tests were used to assess the significant associations between our primary outcome and selected study variables (including socio-demographic characteristics, physical and mental health factors). Two multiple logistic regression models were computed to determine the associated factors with weight cycling.

**Results:** The mean age (SE) of the study sample was 37.4 ( $\pm$ 0.53). The main study findings showed that the prevalence of weight cycling among the study sample was 25.8%. In the logistic regression model, married women, higher Body Mass Index (BMI) and Waist Circumference (WC), non- smoker, perception of the body weight of (increased, decreased or cycled), body image dissatisfaction, and classification as a possible case of eating disorders, were found to be the associated factors with weight cycling among our study sample.

**Conclusion:** The relatively high prevalence of weight cycling among our study sample highlights the need for further research into weight cycling and the associated factors in the Occupied Palestinian territory (oPt). Interventions by health practitioners and policymakers should be considered to encourage healthy dieting behaviors and discourage unhealthy dieting behaviors to lose weight.

#### ملخص

المقدمة: ازداد انتشار السمنة على مدى العقود الماضية في العديد من البلدان المتقدمة والنامية بما في ذلك فلسطين. في الوقت نفسه ، تريد الكثير من النساء فقدان الوزن والبدء باتباع حميات وطرق أخرى لخسارة الوزن. غالبًا ما يحدث فشل في عملية خسارة الوزن، مما يؤدي إلى استعادة الوزن وإعادة النظام الغذائي. قد تبين أن لعملية التغير المستمر في الوزن/ التذبذب في الوزن هذه مشاكل جسدية ونفسية سلبية على الجسم. في فلسطين ، لوحظ تز ايد انتشار الوزن الزائد بين جميع الفئات العمرية في كلا الجنسين. بالإضافة إلى ذلك ، كانت هناك بعض الدر اسات التي أشارت إلى أن سلوكيات الحمية غير الصحية التي تؤدي الى التغير المستمر في الوزن/التذبذب في الوزن كانت شائعة بين فئة صغار السن مثل الأطفال والمراهقين. هناك نقص في المعرفة في فلسطين حول معدل الانتشار والعوامل المؤثرة على ظاهرة التغير المستمر في الوزن/التذبذب في الوزن.

الأهداف: الهدف من الدراسة الحالية هو تقدير انتشار التغير المستمر في الوزن ودراسة العوامل المرتبطة بها بين عينة من النساء في محافظة رام الله والبيرة .

منهجية الدراسة: الدراسة الحالية هي دراسة مقطعية أجريت بين 384 امرأة تتراوح أعمار هن بين 25-64 سنة في محافظة رام الله والبيرة. أجريت الدراسة بين أغسطس واكتوبر من عام 2019 ، وتم اختيار أربعة مراكز طبية غير حكومية. تمت دعوة المشاركين في المراكز المختارة للمشاركة في الدراسة من خلال تعبئة الاستبيان. يتألف استبيان الدراسة من خمسة أقسام تم التحقق من ملاءمتها للتطبيق في السياق العربي باستثناء أسئلة التغير المستمر في الوزن والتي تم تجريبها على عينة صغيرة وإعادة ترجمتها قبل البدء بالدراسة. المتغير الأساسي للدراسة هو التغير المستمر في الوزن/التنبذب في الوزن. تم حساب معدل و نسب المتغير ات التي تم دراستها. وتم استخدام فحص "كاي"لحساب العوامل المرتبطة بالتنبذب في الوزن والتي تتضمن: الخصائص الديمو غرافية, وبعض العوامل المتعلقة بالصحة الجسدية والنفسية. تم حساب نموذجين من الانحدار اللوجستي المتعدد لتحديد العوامل المرتبطة بالتنبذب في الوزن. تتابع التي من الانحدار اللوجستي المتعدد لتحديد العوامل المرتبطة بالتنبذب في الوزن.

أوضحت النتائج أن معدل انتشار التذبذب في الوزن بين عينة الدراسة 25.8 % و في معادلة الانحدار

XI

اللوجستي ، كون السيدة متزوجة، وجود مؤشر كتلة جسم ومحيط خصر مرتفع، وعدم التدخين ، وإدراك وزن الجسم (زيادة أو نقصان أو متغير) ، وعدم الرضا عن صورة الجسم ، والتصنيف كحالة محتملة لاضطرابات الأكل كانت عوامل مرتبطة بالتذبذب بالوزن بين عينة الدراسة.

**الخلاصة:** يسلط الانتشار المرتفع نسبيًا للتذبذب في الوزن بين عينة دراستنا الضوء على الحاجة إلى مزيد من البحث في هذه الظاهرة والعوامل المرتبطة بها في الأراضي الفلسطينية المحتلة. ينبغي النظر في تدخلات المهنيين الصحيين وصانعي السياسات لتشجيع اتباع سلوكيات الحمية الصحية وتجنب السلوكيات غير الصحية منها.

### **INTRODUCTION**

Nowadays, overweight and obesity and their health consequences have become a public health issue [1]. They are comorbid conditions associated with several diseases as diabetes and cardiovascular diseases, particularly if fat is located in the abdomen [2].

In the Eastern Mediterranean Region (EMR), the prevalence of overweight (Body Mass Index (BMI)  $\geq 25$  kg/m 2) increased from 37.9 % in 1980 to 49.6% in 2015, and obesity (BMI  $\geq 30$  kg/m 2) increased from 11.8 % to 19.6 % in the same period which reflected a marked increase in overweight and obesity prevalence in the EMR. In developing countries, overweight and obesity increase was mainly due to changes in socio-economic status, demographic changes, shifting to a high-fat diet, and a sedentary lifestyle [3]. Obesity among women is higher than among men, especially in developing countries, while in developed countries, the prevalence of obesity among women and men is almost the same [4].

At the time of rising obesity, particularly among women, promotion for slim and fit bodies has also been increased as an important factor for being attractive. Accordingly, low body satisfaction pushes women to start dieting in order to lose weight. Dieting is not only prevalent among overweight and obese women but also among normal-weight women [5].

Healthy dieting behaviors such as decreased food intake and increased physical activity are recommended. On the other hand, the engagement in unhealthy dieting behaviors is also common. Unhealthy dieting behaviors include fasting, vomiting after eating, using diet pills, diuretics, laxatives, skipping meals, following very restricted diets, smoking and excessive exercising. Such dieting behaviors are the most common causes of weight cycling, particularly among female dieters [6].

Several other factors are related to weight cycling as being married, overweight or obese, or having a high level of stress. The relationship between weight cycling and these factors was not clear due to the cross-sectional design of most of the studies [7].

While a lot of women are dieting to lose weight, most of the time they cannot achieve their weight loss targets. Regaining the lost weight is common; therefore, a lot of women restart their diet after weight regain [8].

Weight cycling or yo-yo diet has emerged as a result of dieting, failure, or relapse and restart of the diet. The definition of which is unclear, but generally a weight cycle denotes a weight loss followed by gain. The numbers of kilos and magnitude of the cycles were used differently to fulfill the criteria across the studies [9]. The other synonyms are weight variability and weight fluctuation. Because of this variation in the definition, the prevalence of weight cycling was difficult to study, but it has been suggested that dieting and relapsing from the diet are common and prevalent [10].

Weight cycling has many physical consequences. Several large population-based studies linked weight cycling to the high mortality rate among women [11]elevated blood pressure, decreased resting energy expenditure [12], in addition to affecting body fat distribution. It is also found that a higher waist circumference (WC) has a positive relationship with weight cycling. Therefore, frequent weight loss and regain increase the risk of abdominal obesity and eventually cause other health consequences related to abdominal fat accumulation [13].

Female weight cyclers can also have adverse psychological effects on their health, such as less body satisfaction, lower self-esteem on appearance, and they are at higher chance to develop depression and eating disorders [14].

Weight cycling has become a public health issue, it is found to have negative physiological and psychological consequences that could outweigh the positive health consequences. It is important to address this issue among Palestinian women since the prevalence of overweight and obesity has been increased. An increase in dieting and attempts to lose weight among Palestinian females is also noted, which might indicate weight cycling among them. Interventions to prevent weight cycling and encourage following healthy dieting behaviors among women are becoming more important, since several studies suggest that staying obese is somehow better than being a weight cycler.

### **Knowledge Gap**

Regarding the literature on weight and nutrition issues in the occupied Palestinian territory(oPt), there are several studies on the prevalence of overweight and obesity among different age groups (children, adolescents, and adults). In addition, several studies investigated obesity-related physical and psychological consequences [15]. Recently, some work has been carried out to study dieting behaviors, especially among children and adolescents [16-19]. These studies have

indicated that dieting behaviors were common among the studied populations. The reasons of following such behaviors, what are the most common dieting behaviors, and whether these attempts to lose weight were successful or not, were not studied.

Therefore, there is a gap in researches that focus on weight cycling as a whole process of starting the diet, dieting behaviors that are commonly used, and to what extent these attempts of dieting are successful or failed. The other gap is that the studies on dieting behaviors in the oPt addressed dieting behaviors among schoolchildren and adolescents, and there were no studies among adults, particularly among women.

### Significance of the study

Studying the prevalence of weight cycling and the associated factors in the oPt is very important for three reasons. First, this study will add to the literature a new knowledge that was overlooked. Based on the worldwide literature, weight cycling is likely to become a serious public health issue due to the possible physical and psychological health consequences [20]. Second, the existing health services related to physical and mental health factors, which have suggested to be associated with weight cycling, could be improved to encompass the patient's weight loss history [21]. Third, interventions to encourage healthy dieting behaviors could be developed. Public health lectures or campaigns in schools, universities, and other settings especially among women could reduce the frequency of weight cycling [22]. Such interventions can help the target

populations to understand how to engage in healthy dieting behaviors when they want to lose weight, and avoid unhealthy dieting behaviors. While preventing or reducing unhealthy dieiting behaviors, weight cycling and the related physical and mental health consequence will be also reduced or avoided.

#### Aims, objectives, and hypotheses

#### The aim of the study

This study aims to assess the prevalence of weight cycling, and the associated factors among women in the Ramallah and al- Bireh Governorate. The determinants that were reported in the literature to have the most influence on weight cycling will be studied as well. Among these factors are socio-demographic characteristics (age, marital status, education, and income level), and physical health factors including smoking status, the menstrual cycle status, health indicators such as BMI, WC, and Waist to Hip Ratio (WHR). Several psychological or mental factors will be studied as body image satisfaction, the possibility of having eating disorders, and the perceived stress level. The association of weight cycling and the selected variables will be examined.

#### **Research questions:**

- What is the prevalence of weight cycling among women of our study sample in the Ramallah and al –Bireh Governorate?
- 2) What are the socio-demographic factors that are associated with weight cycling?

- 3) Is weight cycling associated with the physical health factors: smoking status, the menstrual cycle status, BMI, WC, and WHR?
- 4) Is weight cycling associated with body image dissatisfaction?
- 5) Is weight cycling associated with eating disorders?
- 6) Is weight cycling associated with the perceived stress level?

## **Hypothesis:**

- I. Weight cycling is prevalent among women.
- II. Weight cycling is associated with some of the selected socio-demographic factors as age, marital status, educational level, working status, and income level.
- III. Weight cycling is associated with smoking status.
- IV. Weight cycling is associated with the menstrual cycle status.
- V. Weight cycling is associated with BMI, WC, and WHR.
- VI. Weight cycling is associated with body image dissatisfaction.
- VII. Weight cycling is associated with the possibility of eating disorders.
- VIII. Weight cycling is associated with the perceived stress level.

# CHAPTER ONE: LITERATURE REVIEW

### **1.1 Core concepts**

The following core concepts will be used in the literature to draw a better conclusion on weight cycling and the associated factors.

#### **Dieting behaviors**

Reduced caloric intake and increased physical activity are the recommended healthy dieting behaviors to lose and control weight [23-25]. Decreasing calorie intake by 500 to 1000 calories per day will help to lose weight among overweight and obese people, and it is considered as the major and effective component to lose weight [23, 26, 27]. In addition to that, physical activity is also recommended to lose weight, the National Heart Lung and Blood Institute (NHLBI) has recommended 30 to 45 minutes of moderate physical activity, three to five days per week to lose or maintain weight [23].

Many individuals who attempt to lose weight do not follow the recommended healthy dieting behaviors; instead, they use unhealthy dieting behaviors that might have physical and psychological consequences on their bodies [28-30].

Some unhealthy dieting behaviors are associated with depression and dysphonic moods among people who used them [31, 32], as well as regaining the weight they lost which make them more prone to frequent dieting [33, 34]. Unhealthy

dieting and medical behaviors will be used in this chapter as indicators for repeated dieting and consequently for weight cycling.

### (Re) start a diet and relapse from the diet

In this chapter, (re)start and relapse points will be used in the process of weight cycling. In figure 1, the left red circle is the point of starting the diet, and the right red circle is the point of relapsing from the diet. These points Figure 1-Weight cycling pocess. refer to changes within weight cycling process. When studying the factors associated with these points of starting the diet and relapsing from the diet, weight cycling will be understood [7].

Start the diet: When women perceive themselves as overweight or obese, they become more vulnerable to start a diet to lose the extra weight. Starting the diet or trying to lose weight is influenced by several factors that will be mentioned later in this chapter. After starting a diet, relapse may occur and weight may be regained, then starting a new diet is possible and results in a weight cycling process. Thus the term "dieting", " frequent dieting ", or " start dieting" in this chapter, will indicate weight cycling [7].

**Diet Relapse**: Relapse is explained in several definitions, and in this chapter, "relapse" refers to "returning to the first weight or more after dieting" or quitting the diet. Relapsing from the diet has become an issue when introducing health interventions since it is appeared to have negative health consequences [35].



Therefore, weight cycling process is defined as the repetitive cycle of weight loss (start dieting) and regain (diet relapse) [36].

The factors that are associated with (re) start a diet and relapse from the diet by following unhealthy dieting behaviors will be discussed in the literature chapter of this study. Studying these factors will help understand weight cycling process.

## **1.2Weight cycling definition**

Weight cycling emerged as obesity prevalence has become more prevalent which results in an increase in weight loss attempts. Obese people want to lose weight because it improves obesity metabolic risk factors as insulin resistance and dyslipidemia [37]. Unfortunately, only about 10 percent of those who want to lose weight maintain the lost weight, and 80 percent of them regained the lost weight within a year [38]. As a result, repetitive weight loss or dieting and regaining the lost weight appeared, and called weight cycling or yo-yo dieting. It was firstly studied by Brownell on rats. He investigated the metabolic effects of diet restrictions followed by the refeeding obese male rats. and he found that weight loss in the second diet restriction trial was two times slower than the first trial which indicated some metabolic changes in rats [39].

Weight cycling definition is not clear yet, but a weight cycle refers to a loss followed by a regain of weight [40], or even a higher weight regain compared to the pre-diet weight [41].

Different criteria used to define weight cycling involving dieting behaviors. Some studies calculated the numbers or the difference of percentages between baseline and follow- up *self- reported* weight [42-44], or by the row numbers or percent differences between baseline and follow-up *measured* weight [43-45].

Some studies counted weight losses *or* regains of weight [46, 47] while other studies counted for weight losses *and* regains [9, 20]. The intervals of weight cycling also varied over months or years [48]. Since different criteria used to study weight cycling, there is no standard definition to comply with it. This is also the reason of the inconsistent results about weight cycling prevalence and the related health outcomes

### **1.3 Weight cycling prevalence**

#### **1.3.1 Prevalence of overweight and obesity**

Weight cycling prevalence is accompanied by obesity prevalence; therefore, it is worth to overview overweight and obesity prevalence, their related factors, and gender difference prevalence.

Obesity prevalence has increased worldwide over the past 50 years [49]. Globally, it is estimated that a total of 1.9 billion were obese adults and 609 million were overweight adults, and this representing around 39% of the world's population [1].

After that, obesity rates have dropped in the past 10 years in several developed countries, in the United States (US) and the United Kingdom (UK). The prevalence in these countries remained approximately 30-34% and 23-24% respectively but it is increasing in other regions of the world [50].

Regarding the developing countries, it was reported that the prevalence of overweight increased by 11% from 1980 to 2013 which is almost 2% higher than the rate in developed countries[51]. For obesity, it was estimated that 62% of the world's obese people live in developing countries [52].

Studies indicated that the prevalence of obesity among children and adults in the EMR –all Arab countries, excluding Algeria, in addition to Afghanistan, Iran, and Pakistan- has increased [53]. The Global Burden of Diseases (GBD) 2015 reported a large increase in the prevalence of both overweight and obesity among adults in the EMR from1980 to 2015 [54].

This increase in overweight and obesity prevalence in the EMR is a result of lifestyle changes due to demographic transition that has started several decades; aging lead to increase in the prevalence of chronic diseases and obesity.

EMR is also facing a nutrition transition, which is characterized by changes in the pattern of food consumption from high fiber food and diet, which contains legumes, fruits, and vegetables, towards increased consumption of refined carbohydrates, added sugars, saturated fat, and animal-based food. Reduced physical activity and increased sedentary lifestyle are also contributed to the increase in overweight and obesity prevalence in the EMR [3, 55].

Obesity is more prevalent among women than men are. As a global estimate, in 2014, it was estimated that 38% of men and 40% of women were overweight, and 11% of men and 15% of women were obese. It was found that women had a higher rate of obesity compared to men in all the EMR countries, and the mean of BMI among women was higher than in men [56].

This gender difference prevalence is due to several factors. First: women's bodies store more fat due to biological factors related to reproduction [4]. Second: childbirth experience also increases the probability of obesity, mainly high parity and a small period of spacing between the births [57]. Third, social and cultural factors that prefer plumpness were reported to be associated with increased obesity and overweight among women [58, 59].

Along with the increase in the prevalence of overweight and obesity, Non-Communicable Diseases (NCDs) have also increased. The NCDs include Cardiovascular Diseases (CVD), cancer, Chronic Obstructive Pulmonary Diseases (COPD), and diabetes.

Metabolic and modifiable risk factors are responsible for the development of these diseases. Modifiable risk factors as tobacco use, physical inactivity, and unhealthy diet largely contribute to NCDs mortality. As an example, 4.1 million deaths every year have been reported due to excess salt/sodium intake, and 1.6 million deaths annually related to physical inactivity. As a result, weight health concerns and dieting behaviors become prevalent among people especially those with NCDs [60].

Palestine is not an exception regarding obesity, and there were many studies on obesity prevalence that vary in their designs, samples, and findings [15].

Early studies showed that the urban Palestinian population had 49% of women and 30% of men to be obese [61], while the following study including Palestinians in the rural areas found 37% of women and 18% of men were obese [62]. Recently, a systematic literature review was conducted to assess the prevalence of obesity and overweight among Palestinian children, adults, and people with NCDs. The results showed that the prevalence of overweight and obesity were 6% (range 4–10%; and 15% (13–17%)in children; 18% (11–29%); 30% (24–38%) in adults; 49% (35–64%) and 40% (31–50%) in people with NCDs [15].

The burden of NCDs in Palestine is high; the first five leading causes of deaths are cardiovascular diseases, cancer, cerebrovascular diseases, and diabetes. The main four risk factors of mortality from these diseases are malnutrition, dietary risks, high fasting blood plasma glucose, and high BMI [63]. According to the MOH reports of 2017 in Palestine, it is reported that of 77166 persons with NCDs in the West Bank, 59% of them were women [64].

#### **1.3.2** Prevalence of weight cycling in the general population

While weight cycling comprises of starting a diet and relapsing from a diet, the prevalence of dieting should be included in our literature.

In the past decades, dieting has increased [20]. Dieting is simply defined as the practice of eating food in a specific manner to decrease, maintain, or increase body weight. It is not only about reducing the amount of food, but also change food quality. Dieting includes a wide range of behaviors such as lowering fat intake, increasing servings from fruit and vegetables, which are considered as healthy dieting behaviors. Dieting is also include unhealthy dieting behaviors as fasting, using medical dieting behaviors as diuretics and laxatives, vomiting and smoking [65].

Lately, dieting increased in the US, it was estimated that about 14 % of women and 7% of men, tried or started to lose weight between 1950 and 1966 [66, 67]. In late 1980s, this prevalence had increased to around 40% of women and 25% of men who tried to lose weight [68]. During the mid-1990s there was a further increase to reach 44% among women, and 29% among men[68, 69].

According to the National Health and Nutrition Examination Survey between 2001 -2002 in the US; it was found that the percentages of people trying to lose weight in the US increased to reach 48% among women and 34% among men [70].

The same survey in the following years (2003-2008), found that the rate of adults trying to lose weight increased to 57% among women and 40% among men [70]. A similar trend on the prevalence of starting dieting was observed in Europe and North America, it was estimated that 25-65% of women and 10-40% of men tried to lose weight (55, 56). All the above studies have consistent results in that women are more likely to engage in dieting compared to men, and most dieters fail to maintain their weight, and most of the time they regain the weight they lost [71].

While dieting has been investigated in the Western world, very few studies focused on the populations other than Western males and females.

Studies among Arab populations rarely studied dieting behaviors. It is worth studying dieting behaviors among Arab Populations, because it is found that these populations are influenced by the Western body image through the media. The western world prefers thin women and this consequently leads to start dieting. Socio-cultural factors as social class and cultural preferences of thinnest in the Middle-East affect the attitudes toward weight and attractiveness especially among females [19]. Although several studies investigated several factors that may develop weight cycling in the Middle-East [72-74], there were no studies on weight cycling as the main outcome.

In summary, there is no precise prevalence of weight cycling since the criteria of weight cycling varied within the studies [40] which already conducted among different populations[21, 75, 76]. However, to the best of our knowledge, weight cycling prevalence is estimated to be at 20-35% in men and 20-55% in women [9, 77-80].

### 1.3.3 The prevalence of weight cycling among children and adolescents

The prevalence of weight cycling among children and adolescents was mainly focused on the influence of media and body image dissatisfaction as will be elaborated below.

Research has indicated that socio-cultural factors as media, family, and peers have a major influence on children and adolescents to develop body dissatisfaction [81, 82]. In terms of media, television, radio, and cinema they affect young people perceptions of their bodies, and leading them to start dieting [83].

Children are influenced by constant exposure to media mean, such as television, internet, and magazines [84]. Media has also created several aspects of weight and beauty among children. As an example: good characters in children's movies

resemble thin, beautiful, and kind characters, whereas, devil characters resemble ugly and obese ones. As a result, young children seem to be aware of the thinnest that exists in their culture, and the influence of the media plays an important role in the development of body image dissatisfaction [85]. A study found that girls between 5 to 8 years who were exposed to images on the television of the thin Barbie doll, reported lower body satisfaction and greater desire to be thinner than girls who did not have this exposure. The results of this study showed that the constant exposure to the images of the thin Barbie doll, contributed to an increased risk of disordered eating and dieting among those girls [86]. The influence of the media on girls' mentality satisfaction regarding their bodies is evident[87].

The same trend regarding body image dissatisfaction was found among adolescents. A research among 10<sup>th</sup>-grade students reported that 13% of them tried to emulate some behaviors that would help them reach the desired body weight. Unhealthy dieting behaviors as using laxatives and diuretics, and intentional control of food consumption were common among those young females.

In a large cohort of preadolescents and adolescents study conducted in the US, it was found that dieting behaviors were common among them, and dieting was a predictive variable to weight cycling during the three years of following up. The authors of this study suggested that weight regain resulted from following unhealthy dieting behaviors as skipping meals and very low calories diets. The maintenance of weight loss was very hard among adolescent dieters and initiated.

#### **1.3.4 Prevalence of weight cycling among athletes**

Dieting behaviors are accepted in a wide range of sports [89, 90]. Slimming is common among athletes who participating in specific sports [91]. Other sports require low body weight and /or low body fat, and high muscles to achieve good results in the competitions. Achieving these targets of a slim body in many types of sports is achieved by using different dieting behaviors [89].

Usually, athletes engage in unhealthy dieting and medical behaviors to lose weight especially before the competitions. Using laxatives, vomiting, diuretics, sweat suits, and excessive exercising are common among athletes. These unhealthy dieting behaviors are more common among weight-sensitive sports in which body weight has a high impact on sports performances, as dancing, gymnastic, judo, and taekwondo [92]. A study that was conducted among Junior Taekwondo athletes showed that rapid weight loss due to unhealthy dieting behaviors was very common among them before the competitions, and lead to weight cycling later [93].

Weight cycling among athletes relates to some health consequences. A cohort study of 1838 male elite athletes who had represented Finland in major international sports competitions in 1920–1965, found that weight cycling enhanced subsequent weight gain and obesity among athletes [94].

#### 1.3.5 The prevalence of weight cycling among older people

Dieting and fear of gaining extra weight are common among all ages especially among women, and substantial number of men [95]. Women are concerned with body weight that lead to frequent dieting and weight cycling in older age [96].

Aging women are vulnerable to social pressure, which is defined as the direct influence on people by the surrounding environment and comments from others. This social pressure drives women (even those who have a normal weight) to engage in several dieting behaviors to be thin in older age [97].

Unhealthy dieting behaviors may represent a health threat for older women, due to the vulnerability to malnutrition and muscle loss in this age [98, 99]. Development of weight cycling and difficulties in recovering the muscle mass but regaining the fat mass, are also common when engaged in unhealthy dieting behaviors among older women. Decreased muscle and increased fat that result from dieitng, could put the woman in old age at a higher risk of relative sarcopenia obesity; gain in body fat but a loss of muscle and bone mass and functional capacity [20].

### **1.4 Factors associated with weight cycling**

Studies investigated several factors associated with weight cycling as sociodemographic, physical, and psychological factors. Some of these factors appeared to promote (re) start the diet, and others related to *relapse* from the diet. This will be discussed in this section.

### 1.4.1 Age

Studies have suggested that dieting starts early. Parental encouragement for their child to diet, especially on the part of mothers, was a predictive factor of increased adolescent unhealthy dieting behaviors to lose weight [100-102].

Dieting at an early age is associated with unhealthy medical dieting behaviors as using laxatives that continued to young adulthood [103]. Also, people who are dieting at an early age appeared to have a greater BMI to start with, a greater change in weight, and experience weight cycling over time [104]. Young age, highr BMI and weight cycling have been associated with each other. It is found that people with severe history of weight cycling have a significantly younger age of onset of their obesity than do mild cyclers, and they are initiating dieting at a significantly younger age [105].

### 1.4.2 Sex

As mentioned early, dieting behaviors and weight cycling increased when obesity increased. Generally, Obesity hence dieitng and weight cycling among women is higher than among men [9, 77-80].

Several reasons force women to engage in dieting behaviors more than men. Firstly, women in the reproductive age are prone to weight gain due to biological (as genetic susceptibility), and behavioral factors as smoke cessation and decreased physical activity after childbearing. Such factors lead to weight gain and can alter a woman's weight trajectory [106]. Secondly, concerns about body image and eating are increasingly prevalent among women compared to men [107]. Thirdly, body weight and image issues among women contribute to how they feel about themselves and influence their feeling of being happy. It is found that women satisfaction with their weight and shape was a determining factor in their feeling of happiness [108]. In addition, a lot of women experience low body satisfaction[109], because of this, they tend to lose weight using different dieting behaviors, and most of the time they fail to achieve their weight loss goals [110]. The mentioned factors encourage women to start dieting and experience weight cycling more than men.

### 1.4.3 Weight, BMI, and obesity

Generally, overweight and obese people attempt to lose weight. The extra weight results from energy imbalance of increased energy-dense and high-fat food intake, in addition to physical inactivity. Other environmental and genetic factors contribute to the etiology of overweight and obesity [111]. Some overweight and obese people achieved their weight loss goals using healthy dieting behaviors, as moderate calorie intake and moderate physical activity [112]. The others use unhealthy dieting and medical behaviors. Most of the time using unhealthy dieting behaviors leads obese people to relapse from the diet and engage in frequent dieting [113, 114]. Researchers have found that overweight and obese people who followed unhealthy dieting behaviors relapsed and regained more weight than their initial weight [115]. Overweight and obese people are prone to following unhealthy dieting behaviors and experience weight cycling more than normal weight people [113, 116].

Despite the majority of the studies found a relationship between being overweight or obese and weight cycling, yet normal weight people of both sexes are dieting. A survey of 16,486 university students conducted in 21 European countries, showed that 44% of women who had an overall BMI of 20.5 kg/m<sup>2</sup>, and 17% of men who had an overall BMI of 22.0 kg/m<sup>2</sup>, were engaged in frequent dieting to lose weight [117].

#### **1.4.4 Socio-economic Factors**

In terms of educational level, it was reported that a higher percentage of maintainers (who maintain their weight) received a higher level of education than relapsers (who relapse in diet)[118].

In terms of income level, the expensiveness of healthy eating is perceived as a barrier to maintain weight loss among people with low income. Expensiveness of healthy food drives low-income people to relapse from diets and regained the lost weight [119].

Studies also showed that the determinants of healthy dieting behaviors have traditionally been linked to the individual socioeconomic position (SEP). It is suggested that SEP is associated with less healthy dieting behaviors [120, 121].

From a broader aspect, many studies have examined the associations between dieting behaviors and the neighborhood food environment (the availability of fruits and vegetables and fast-food consumption) [122-124]. It is showed that the presence of neighborhood convenience stores that sell unhealthy food may be associated with lower quality diets and unhealthy dieting behaviors. Low-income

individuals may be the most sensitive to these convenience stores availability [124].

Marital status is also one of the well-known factors that affect body weight. Early studies found a positive relationship between marital status and body weight. Being married is associated with weight gain [125-127] as well as being physically inactive [128, 129].

Being married was found as a factor that enhances weight regain after relapsing from the diet [130]. Mechanisms underlying the relationship between weight change and getting married are unknown, but may include reducing social pressure to control weight after marriage. Besides that, married people may have the opportunities to eat through shared eating occasions, and this leads the spouses to relapse from their diets [128, 131].

### 1.4.5 Smoking

There were inconsistent results regarding the association between smoking, dieting, and weight cycling. This is probably due to the methodological differences in measurements and classifications of smoking, dieting, and weight cycling [69, 132]. However, smoking has been cited as dieting method to control or lose weight by women in many studies [133, 134]. Supposedly, smokers may use cigarettes as a "tool" when start dieting, which could confer a relative weight-loss advantage to non- smokers, and ex-smokers. This could be especially true if smoking, effectively, curbs hunger when following the diet, albeit deleterious consequences on smoking behavior.
Regarding females, it has been suggested that females who perceived themselves to be overweight are more likely to smoke to lose weight [135, 136]. Furthermore, it is concluded that weight gain following smoking cessation, particularly among females, may be a significant barrier to smoking cessation [137]. Current smoking among women is associated with repeated dieting in all ages [138].

Although it has been suggested that smoking is associated with repeated dieting, but some studies have found an opposite relationship. The literature provided several reasons to believe that dieting could be more among non-smokers than smokers could. It has found that smokers tend to have unhealthy food choices such as fewer fruits and vegetables and more alcohol and soft drinks, and they are considered less active compared to non-smokers and ex-smokers. This pattern of lifestyle made the smokers have less will to start dieting [139-142]. Other studies have suggested that dieting to lose weight requires making more fundamental changes in the lifestyle, and it might be more difficult among smokers than nonsmokers.

#### 1.4.6 Eating disorders

Dieting is linked with eating disorders as anorexia and bulimia nervosa in young women [143]. Regarding weight cycling, studies on the association between eating disorders and weight cycling are scarce. However, consistent positive relationships were found between eating disorders and weight cycling [144, 145].

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A recent study investigated the relationship between weight cycling, binge eating, and depression in overweight and obese adults, found that severe weight cyclers participants reported a significantly higher depression rating and binge eating when compared to non-weight cyclers [146].

It is worth mentioning that the most published data on weight cycling and eating disorders have been cross-sectional studies, therefore, we cannot infer the causation and the temporality of the association between them [14].

## 1.4.7 Body image satisfaction

Body image is "the perception that a person has of their physical self and the related thoughts and feelings that result from that perception"[147]. Concerns about body image, eating, and food are increasingly prevalent among women [107], which may provoke body image dissatisfaction [148, 149]. Body image dissatisfaction has become a public health issue. It is associated with some negative health consequences as developing eating disorders [150].

In the Middle East regions, some studies showed that dissatisfaction with body image could result in dieting and changing eating behaviors. For example, reducing energy intake and increasing energy expenditure to reduce body weight [151, 152]. It was found that body image dissatisfaction is a more reliable factor to start dieting than current BMI among women [153]. Particularly, body image dissatisfaction is considered as a predictor of relapse from the diet [154].

#### 1.4.8 Stress

Stress is considered as a factor of diet relapse and regaining weight. It was found that eating due to stress was among the most common reasons for diet relapse, and weight regain after weight loss [155]. A cross-sectional study was conducted in Abu Dhabi to examine the association between perceived psychological stress levels among dieting and non – dieting individuals. This study found that dieters had a higher perceived psychological stress when compared to those who do not undertake a diet [156].

## **1.5 Weight cycling health consequences**

#### **1.5.1 Mortality**

There is limited data on the relationship between weight cycling and mortality [157]. Although, several studies have found no association between them [11, 158-160], but it has been suggested that weight cycling weight cycling increases the mortality from cardiovascular conditions [161-166]. Weight cycling is related to several indicators that worsen cardio-metabolic functions, as increased fasting insulin concentration [167] and C-creative protein level[168] as well as lowered HDL-C level[47]. Alterations in these indicators could have a relationship with an increased risk of all-cause mortality.

A cohort study found that weight cycling is a major risk factor for all-cause mortality rate while stable obesity did not [165]. This relationship between weight cycling and mortality calls for developing methods of interventions that can ensure better successful weight loss attempts, and prevent weight cycling and its related health consequences [169].

#### **1.5.2** Morbidity (physical and psychological health consequences)

Investigation of the physiological effect of weight cycling emerged in the 1990s. Brown et al. studied the metabolic effect of dietary restriction followed by refeeding an obese male rat. He found that weight cycling decreased the metabolism rate in rats [39]. Further studies showed that weight cycling might have physiological and psychological health consequences.

In terms of body weight and body composition, weight cycling appeared to be related to higher BMI, body fat percentage, WC, and greater fat mass distribution to the upper body [47, 162, 170-173].

Regarding women, it is found that weight cyclers women are more probably to have higher BMI and body fat mass compared to non- cyclers women [170]. Weight cycling history in women is associated with abdominal fat accumulation [174].

Additionally, it was suggested that weight cycling develops fluctuations of cardiovascular risk indicators, such as blood pressure and heart rate. An increase of these indicators above normal levels occurs during the periods of weight regain, that in turn put an extra load on the cardiovascular system[20]. A cohort study that included 27, 548 men and women followed for two years, found that weight cycling is associated with the incidence of hypertension[175].

While most of the studies investigated the physical consequences of weight cycling, there were fewer studies of psychological effects with conflicting results [14]. Several studies have found a significant relationship between weight cycling and mental health [77], depressive symptoms [146], and binge eating as an outcome [145, 146, 176].

The association between weight cycling and psychological events may be considered as bidirectional. The first direction is that some psychological factors as stress can develop weight cycling [177]. Stressed people may not achieve the desired weight loss goal and they are prone to regain the weight they lost [178]. Also, poor psychological status is associated with increased food intake [179] which in turn leads to weight gain and repeated dieting [180, 181].

The second direction is that weight cycling affects the psychological status of weight cyclers. A recent study investigated the relationship between weight cycling, depression, and binge eating. This study found that severe weight cyclers reported a significantly higher rate of depression when compared to non- cyclers [146].

#### Summary

Repeated cycles of weight loss and regain, known as weight cycling are prevalent; they occur in males and females but are more common among females, and in both overweight and non-overweight people. While there are no consistent findings on the metabolic effect of weight cycling in which the subsequent weight

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loss is difficult and the regain becomes easy, it is possible that weight cycling could occur under some conditions or in particular individuals.

There are consistent results on weight cycling physical health consequences such as enhancing abdominal fat accumulation. Weight cycling may also have negative psychological and mental outcomes; studies have shown an increased risk for psychological disorders and binge eating. The mechanisms of the relationships between weight cycling and several physical and mental health factors are not clear. So further studies on weight cycling and related health consequences are needed. The promotion of weight maintenance interventions is an important priority.

# **CHAPTER TWO:**

# METHODOLOGY

## 2.1 The study design

This study was a cross-sectional study among a sample of 384 adult women. The sample recruited from four non-governmental medical centers in the Ramallah and al -Bireh Governorate. Women invited to participate in the study, and eligible women filled the questionnaire during the summer of 2019.

## 2.2 Study area and population

The Ramallah and al–Bireh Governorate is one of the 16 governorates of the oPt. This governorate covers a large section of the central West Bank in terms of land, and it is located on the northern border of the Jerusalem Governorate. According to the Palestinian Central Bureau of Statistics (PCBS), the Governorate has a population of 328,861; 162.8333 males, and 159,360 females. The total number of the population in the urban area is 143,169, and 116,779 and 16,033 residences in rural areas and camps respectively [182].

#### **2.3** The study sample and sampling frame

In this study, the target population was Palestinian adult women aged 25-64 years who lived in the Ramallah and Al- Bireh Governorate.

The study sampling frame included the selection of the non-governmental medical centers located in the Ramallah and Al–Bireh Governorate.

According to the data obtained from the Ministry of Health (MOH), the number of the non-governmental medical centers in the Ramallah and Al –Bireh Governorate are fifty-one centers. Fifteen of them located in Ramallah and al-Bireh cities. The largest four in terms of visitors number ( according to the personal communication with each center owner) were chosen for the current study. The selected centers were the Specialized Medical Care Center, Allmed Medical Center, Ghosheh Medical Center, and Al - Zakat Committee Medical Center. It is worth mentioning that these centers located in Ramallah and al Bireh cities, and we chose them due to time and budget limitation to reach farther centers in the governorate.

## 2.4 Sampling method, sample size, and eligibility criteria

In this study, the sampling methods consisted of two stages. The first stage was a convenience sample selection of the non-governmental medical centers in the study area. The second stage involved the selection of the participants based on a stratified sampling. This sampling method was suitable for the time and budget limitations of our study.

The sample of participants divided into two separate homogeneous groups (two strata), according to age and type of locality distribution of Palestinian women in the Ramallah and al Bireh - Governorate. A random sample was selected from each stratum, which is proportional to the size of the stratum of the entire population.

Eligible women for this study included all women aged 25-64 years, who were not diagnosed with any of these diseases: diabetes, thyroid gland diseases, and cancers. The literature has shown that these diseases affect body weight and result in unintentional weight loss or gain, while weight cycling results from "intentional" loss of weight. Pregnant women were also excluded, in addition to women who had a pregnancy termination in the previous 24 months, because of unintentional weight loss and regain during pregnancy. Women who take fatlowering medicines were also excluded from the study to avoid any bias regarding body fat composition.

The sample size calculation was based on the formula of infinite population sample size (SS) equation:

$$SS = (z^2 * p * q) / d^2;$$

Where z is the  $\alpha$  risk expressed in the z-score,

P is the predicted prevalence,

Q is (1-p) and d is the absolute precision

D is the confidence interval

In this study, the confidence interval was (95% CI), ( $\alpha$ =0.05), so the Z score was equal to 1.96, and the predicted prevalence of weight cycling was of p=0.5. Therefore, a sample of 384 women was needed and divided equally on the

selected centers . Ninety-six women recruited from each center.

# **2.5 Data collection tool**

The data collection tool of this study included a semi-structured questionnaire. This tool is designed to explore the prevalence of weight cycling and the associated factors among women in the Ramallah and al- Bireh Governorate. The questionnaire included five sections: the first section consisted of sociodemographic characteristics of the participants (age, marital status, type of locality, educational level, employment status, and income level). These questions were tested and validated in the Palestinian Family Health Survey and used in our study tool. This section also included some variables regarding the participant health, such as smoking status and the menstrual cycle status.

The second section aimed to assess weight cycling. It was adapted from weight cycling questionnaire [183]. The criteria used to define weight cycling were: intentionally lost weight, lost at least 5 kilograms in the previous 24 months, and regained at least 5 kilograms at least once during the previous 24 months.

## The rationale to use this questionnaire for assessing weight cycling

The validity and internal consistency of this questionnaire to evaluate weight cycling were examined in Brazil. In this questionnaire, researchers developed weight cycling questions by taking into account what has been used in the previous research to assess weight cycling on different populations [183]. The magnitude of weight cycling in the literture showed that the number of kilograms lost and regained ranged from 2.3 kilograms [80] to 10 kilograms [170]. Regarding weight cycling episodes interval, it ranged from a short period of months to a lifetime period.

The researchers of this weight cycling questionnaire have suggested that there is no evidence that 5 kilograms in two years are associated with clinical outcomes. However, they found that 5 kilograms as a cut- off point was used in most of the studies. In addition, we assumed that this cut – off point would minimize the recall bias, because using an integer of kilos to lose and regain weight without digits would be easier to remember by the participant. Also, most of the studies which their outcomes were similar to our study, used almost the same criteria of weight cycling. These criteria were : intentionally lost and regain weight of at least 5 kilograms in the past two years [184].

Regarding two years interval, a study showed that the person whose weight cycled in two years is more likely to keep cycling in the following years. Therefore, the questionnaire can identify individuals who are more likely to be weight cycler[79]. Based on these advantages, we decided to use this questionnaire of weight cycling.

It is worth mentioning that there was no validated weight cycling questionnaire among the Arab population. Therefore, weight cycling section was translated and then back-translated (English- Arabic- English) because the original questions were in English. Weight cycling questions were also tested for external validity by an expert.

A question of how the participant perceived her weight in the past 24 months was added to weight cycling section. This question was added because it is suggested that perceived weight status rather than measured actual weight, may be an important determinant of dieting and weight cycling [116, 185]. Therefore, this question might indicate the prevalence of weight cycling. Weight perception is also easier to remember than quantifying weight loss and regain in a specific period [183]. Hence, we intend to measure weight cycling prevalence based on the three questions of weight cycling; intentionally loss and regain at least 5 kilograms in the past 24 months, in addition to the perceived weight status question.

Since weight cycling is associated with unhealthy dieting behaviors, an openended question about the types of dieting behaviors, and the reasons to follow such behaviors was also added to weight cycling section in the questionnaire. This question aimed to explore what are the most frequent dieting behaviors that are prevalent among weight cycler women, and the most common reasons to follow these dieting behaviors.

The third section was to screen the possibility of eating disorders, using the SCOFF questionnaire. This acronym is based on five questions, and it is the abbreviation of the highlighted letters from each question of the following:

- Do you make yourself Sick because you feel uncomfortably full?
- Do you worry you have lost Control over how much you eat?
- Have you recently lost more than **One** stone in 3 months?
- Do you believe yourself to be Fat when others say you are too thin?
- Would you say that Food dominates your life?"

This tool is considered a simple, memorable, and effective tool to detect eating disorders. Answering (yes) to two questions or more out of the five questions will indicate that this case is a possible case of anorexia or bulimia or other eating disorder. The Arabic version of the SCOFF was validated in Arab regions mainly in Beirut[186], and recently in Palestine [187].

#### The rationale to use the SCOFF questionnaire

There are many scales to assess eating disorders. In Palestine, there was a study conducted at An- Najah National University aimed to examine the prevalence of disordered eating attitudes among female students. This study used two scales to assess eating disorders: the SCOFF and Eating Attitudes Test (EAT-26). They found that the internal consistency of EAT-26 and its subscales were higher than of the SCOFF questionnaire. However, they found a significant and positive correlation between the two scales, in addition to a high degree of agreement between them. Therefore, we decided to use the SCOFF because it is easier and includes fewer items to be memorable. Using the SCOFF scale with less items compared to EAT-26 scale, could help avoid the participant boredom to complete other sections in this study questionnaire [187].

The fourth section aimed to measure the perceived stress levels using the perceived stress scale. The scale asks 10 questions about individual feelings and thoughts during the last month. The Arabic version of this scale showed adequate reliability and validity to be used among the Arab population[188].

Each question has five values ranging from 0 to 4 (0= never, 1= almost never, 2= sometimes, 3= fairly often, 4= very often). Then the researcher reversed the

values of (4th, 5th, 7th, and 8<sup>th</sup>) questions as the following:

(0=4/1=3/2=2/3=1/4=0), and sum up the scores, to identify the stress level according to these categories:

► Scores ranging from 0-13 classified as low perceived stress level.

► Scores ranging from 14-26 classified as moderate perceived stress level.

► Scores ranging from 27-40 classified as high-perceived stress level.

The rationale to use perceived stress level over another stress scale Most of the studies in Palestine that aimed to assess stress level among different populations, used the Depression Anxiety Stress Scale (DASS) [189, 190]. The DASS scale measures anxiety, depression, and stress. It is argued that respondents to the DASS scale should be very truthful and aware when answering the items to be able to distinguish between the three variables. It also argued that DASS scale items could be too long when used as an independent variable [191].

For our study, we preferred to use the perceived stress level scale. The Arabic version of this cale showed adequate reliability and validity, and is considered a suitable instrument to assess perceived stress among Arabs [188]. In addition, this scale has fewer items compared to the DASS scale, and we do not want the participants to lose their focus on the main outcome questions (weight cycling questions). So we chose the perceived stree level scale to assess the stress level among the study sample.

For body image satisfaction, there were many scales to use, but we were satisfied with using one question; whether the participant is satisfied, sometimes satisfied, or dissatisfied with her body image. This question was added to take a general idea on the relationship between weight cycling and body image satisfaction.

The fifth section of the questionnaire included the anthropometric measurements; (weight, height, WC, and hips circumference). Measurements were taken by following the WHO STEP wise approach to Surveillance (STEPS).

The height was measured to the nearest 1-cm, the participant standing to a wallmounted rod without wearing shoes. Weight was measured to the nearest 0.1-kg. The digital scales were calibrated every morning by using 1-kilogram weight. WC measurement was made at the approximate midpoint between the lower margin of the last palpable rib and the top of the iliac crest. For hips circumference, the measurement was taken around the widest portion of the buttocks. Both measurements were repeated twice; if the measurements were within 1 cm of one another, the average should be calculated. If the difference between the two measurements exceeded 1 cm, the two measurements should be repeated [192]. The overall questionnaire is provided in (**Annex 1**).

# 2.6 Fieldwork process

Before starting the fieldwork, a pilot study by the main researcher was conducted on four women to examine the flow, clarity, and the sequence of the questions. Five fieldworkers were trained for two days to conduct the fieldwork and to take the anthropometric measurements. The actual fieldwork took place from 15 August to 15 October 2019. The fieldworkers distributed themselves between the centers. Collecting the data shifted between morning and evening to see more participants with different needs at different times. At the end of every day, the main researcher checked the questionnaires and kept them in a box.

It is worth mentioning that the centers cooperated with the study team and helped them during the fieldwork. After the completion of data collection, the centers were thanked for their welcoming and corporation.

## 2.7 Ethical consideration

The Committee of Research Ethics at the Public Health Institution in Birzeit University reviewed the proposal. The approval from the medical centers was obtained from the owner of each center. A verbal consent form was obtained from the participating women. A copy of the consent form provided in (**Annex 2**). Women had the option of voluntary participation. The participants were informed about the objectives and the importance of the study, and they had the choice to stop their participation whenever they want.

Confidentiality was ensured by limiting the access to subject's information. Computerized data secured by passwords, and anthropometric measurements were taken in a private room at each center. The field workers read the results and the interpretations of the anthropometric measurements to each participant.

## 2.8 Study measures and variables

**Dependent variables:** The primary outcome in this study was weight cycling. The questions of weight cycling were: intentionally lost weight, lost at least 5 kilograms in the previous 24 months, and regained at least 5 kilograms in the same period. The magnitude of weight cycling episodes was at least one cycle. Only the participant who answered these three questions with yes was considered as a weight cycler.

**Independent variables:** Included the selected socio - demographic characteristics. Some of these variables were not analyzed in their original forms but were changed and /or recoded for analytical purposes. For instance, the age of the participants was recorded from a continuous to a categorical variable with four categories for analysis. Marital status was categorized into married and unmarried because there were small cells in the other categories. Employment status was recoded as currently employed and currently not employed. Educational level was recoded into secondary and below, and associated diploma and above because of small numbers in the other cells.

**Other variables:** Smoking status recoded into smoking (who smokes cigarettes, hookah or electronic cigarette regularly or irregularly), and non-smoking (who is not a current smoker and never been one).

Regarding the physical health indicators, BMI was computed from weight in kilograms divided by squared height in meters. Then, BMI was categorized into normal, overweight, and obese classes. WHR obtained from the WC divided by hip circumference.

## 2.9 Statistical data and analysis

The data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 22.0.

**Descriptive statistics:** Descriptive summaries were computed to describe the baseline characteristics of the sample and the prevalence of weight cycling. The continuous variables were presented in terms of means and standard errors (SE), and the categorical variables were presented as percentages (%).

**Bivariate analysis:** Bivariate analyses were carried out to test the relationship between the dependent variable (weight cycling) and the independent variables. To test the significance between the study dependent variable and the categorical independent variables, Chi-square ( $\chi^2$ ) analysis was used and the statistical significance was defined at P<0.05.

Confidence intervals (95% CI) were used to examine the differences in the proportions between the study sample and the Palestinian population concerning age and type of locality.

Detailed analyses and interaction analyses conducted between the dependent variable and some of the independent variables. These analyses carried out to acquire more understanding of the prevalence of weight cycling within the independent variables.

# 2.10 Multivariate analysis

Two logistic regression analyses were conducted to identify the selected independent variables associated with the dependent variable (weight cycling). The results of this regression model were presented by the adjusted odds ratio, unadjusted odds ratios, confidence intervals (95% CIs), and probability values (p-values).

The second model was for the significant variables in the first model in addition to the age category variable. This model was carried out to explore the best predictors (variables) associated with weight cycling. The results of this model were presented by adjusted odds ratio, confidence intervals (95% CIs), and probability values (p-values).

# **CHAPTER THREE:**

# RESULTS

## **3.1 Baseline sample characteristics**

We calculated the confidence intervals of our sample proportions and compared them with the general population proportions. This was done to test if this study proportions in terms of age and type of locality were similar to the general Palestinian women population in the same age range in the Ramallah and Al-Bireh Governorate.

Regarding age distribution, at the  $\alpha = 0.05$  level of significance, there was not a sufficient evidence to conclude that there is a difference in the proportions of the this study sample and the general population except for the age category of 25-34 years. In our sample, the proportion of this age group was smaller than the entire population. This might be because our sample was clinic-based, and this young age group is less likely to have medical conditions to visit these medical centers compared to the general population (**Table 3.1**).

For the type of locality, there was not a sufficient evidence at the  $\alpha = 0.05$  level to conclude that there is a difference in the proportions of the study sample and the general population, except for the rural proportion. It was smaller in our sample than to the entire population. This was possible because the centers we chose were in the center of the main cities, and camps and cities residences are more likely to visit the centers in the main cities than village residences do. In addition, villages almost have similar medical centers of our sample; therefore, they tend to visit the village centers because it is easier to reach than the centers in the main cities

# (Table 3.2).

Table 3.1 -Sample by age distribution compared to Palestinian population age distribution inthe Ramallah and al Bireh Governorate.

	25-34		35-44		45-54		55≥	
	N	(95% CI*100)	N	(95% CI*100)	N	(95% CI*100)	N	(95% CI*100)
Study age distribution	182	47 (42.0- 52.0)	101	26 (22.0- 31.0)	72	18.9 (14.8- 22.7)	29	7.6 (4.9-10.2)
Palestinian women age distribution in the Ramallah and al-Bireh Governorate	25264	30	18119	22	130 27	16	8042	9.6

Table 3.2-Sample by locality distribution compared to Palestinian locality distribution in the

Ramallah and al Bireh Governorate.

	Urban			Rural	Camp	
	N	(95%CI*100)	N	(95%CI*100)	N	(95%CI*100)
Study population distribution by locality	213	55.4	147	38.4	24	6.3
Palestinian women distribution by the locality in the Ramallah and al- Bireh Governorate	3173 0	49.2	29567	45.9	3155	4.9

## **3.2 Socio-demographic characteristics**

**Table 3.3** provides a summary of the socio-demographic characteristics of the study sample. 384 women aged 25-64 years participated in this study with a mean age (SE) of 37.4 ( $\pm 0.53$ ), and the highest percentage of women (47%) was in the age group of 25-34 years.

Almost half of the participating women (55%) resided in urban areas; 38% resided in rural areas; while the rest resided in refugee camps. The majority of the women were married (79%).

In terms of educational level, about 67% of women had an associate diploma and beyond. Up to 43% of women reported they were working. In terms of income level, around 59% of women had an income that ranges between 2000less than 3500 Shekels (ILS), 13% had an income that is less than 2000 ILS, while around 10% had an income that exceeds 5000 ILS.

Socio-demographic factors							
	Т	otal					
Variable/Category	N=384						
	n	%					
Age ( years)							
25-34	182	47.4					
35-44	101	26.3					
45-54	72	18.8					
55≤	29	7.6					
Type of locality							
Urban	213	55.5					
Rural	147	38.2					
Camp	24	6.3					
Marital status							
Married	303	78.9					
Unmarried	81	21.1					
Educational level							
Secondary and below	127	33.1					
Associate diploma and beyond	257	66.9					
Employment							
Working	166	43.2					
Not working	218	56.8					
Income level							
Less than 2000 ILS	49	12.8					
2000 – less than 3500 ILS	225	58.6					
3500 – 5000 ILS	73	19.0					
More than 5000 ILS	37	9.6					

Table 3.3- Baseline sample socio-demographic characteristics.

## **3.3 Physical health factors**

The prevalence of regular (daily) tobacco smoking women was 6%, the prevalence of irregular (occasional) smoking women was 27%, and the prevalence of non -smoking women (never smoke and currently non - smokers) was 66%. In terms of the reproductive health of the participating women, around 65% of them had a regular menstrual cycle; 21% had irregular menstrual cycle; 2% had their menstrual cycle with hormonal replacement therapy. The rest of women did not have their menstrual cycle.

The prevalence of obesity (BMI $\geq$ 30) was 29%, and the prevalence of overweight (BMI >25 and BMI <30) was 37% with a sample mean (SE) of BMI of 27.5( $\pm$ 0.30).

The prevalence of central obesity was measured by WHR and WC. The percentage of women who had a WC >88 cm was 48%, and 56% of them had WHR $\geq$ 0.85. These percentages of WC and WHR reflected relatively high proportions of women who were at risk of central obesity (**Figure 2**).



Figure 3.1-Physical health factors distribution.

## **3.4 Mental health factors**

**Figure 3.2** shows the mental health factors descriptive summaries. The majority of women were dissatisfied and sometimes satisfied with their body image (57%). In terms of the possibility of eating disorders, half of the participants (50%) were classified as possible cases of eating disorders. For the perceived stress level, most of the women (79%) had a moderate perceived stress level, and about 10% of them had a high perceived stress level.



Figure 3.2-Mental health factors distribution.

# 3.6 Weight cycling

Weight cycling has three questions: intentionally lost weight in the past 24 months, lost at least 5 kilograms, and regained at least 5 kilograms in the same period at least one time. Proportions of each criterion of weight cycling among the study sample displays in (**Table 3.4**).

Weight cycling questions							
	Ν	%					
In the past 24 months, did you inter	ntionally lose weight?						
Yes	151/384	39.3					
No	233/384	60.7					
If yes, in the past 24 months did you	u lose at least 5 kilograms	?					
Yes	138/151	91.4					
No	13/151	8.6					
If yes, in the past 24 months, did you gain at least 5 kilograms?							
Yes	99/138	71.7					
No	39/138	28.3					

Table 3.4-Weight cycling questions descriptive summary.

The prevalence of weight cycling among the study sample based on these three questions (those who intentionally lost weight at least 5 kg, and regained at least 5kg in the same period at least one time in the past 24 months) was around 26% as shown in **Table 3.5**.

	Total				
Weight cycling prevalence	(N=384)				
	n	%			
Yes	99	25.8			
No	284	74.2			

Table 3.	5- Weigh	t cycling	prevalence.
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## **3.5 Perceived weight status in the previous 24 months**

In this study, we have measured weight cycling using perceived weight status and actual weight loss and gain. Forty-two percent of women perceived their weight as cycled in periods of losses and gains in the previous 24 months. Fewer percentages of women perceived their weight as stable, decreased, or increased weight in the previous 24 months as presented in **Figure 4**.

The percentages of either weight cycling or perceived weight status, which were (26% and 42% respectively), indicated that weight cycling was common among our study sample.



Figure 3.4-Perceived weight status in the past 24 months.

# **3.7** Weight cycling and its associated factors

Several studies have identified many factors that are associated with weight cycling. The section below will display the associations between weight cycling and selected socio-demographic, physical, and mental health factors. Bivariate

analyses of the dependent variable (weight cycling) and selected independent variables will show statistically significant associations at the significance level of p-value <0.05.

### 3.7.1 Socio-demographic factors

The bivariate analyses between weight cycling and selected socio-demographic variables of age, type of locality, marital status, education level, income level, and employment status showed different associations between the dependent variable and these variables **Table 3.6.** 

#### Age

Age was not significantly associated with weight cycling. However, the highest percentage of weight cycling was in the youngest age group of the study sample (25-34 years), which was 29%. The prevalence of weight cycling was almost the same among the other age groups.

## The type of locality

The type of locality was not significantly associated with weight cycling (p-value=0.110). Due to the small number of participant women from the camps, we could not identify any case of weight cycling among them; hence, camp category was excluded from the analysis.

#### **Marital status**

Women were grouped into married and unmarried because of the small numbers in the widowed and divorced categories. We could not find a statistical association between weight cycling and marital status in this bivariate analysis.

#### **Educational level**

Education was categorized into secondary and below, and associate diploma and beyond, and it was not significantly associated with weight cycling. However, weight cycling was more prevalent among women who had and education level of associated diploma and beyond (28%), when compared to women who had an education level of secondary education and below (22%).

#### Employment

Women who were employed at the time of the data collection had a higher weight cycling prevalence of about 32% compared to women who did not work (21%). This association between weight cycling and employment was statistically significant (p- value=0.016).

#### **Income level**

Income level was not significantly associated with weight cycling (p-value=.166), but the highest prevalence of weight cycling (29%) was among women who had an income level of 2000 – less than 3500 ILS. The least prevalence of weight cycling was among women with an income level of  $\geq$  5000 ILS which was 16%.

Table 3.6- Bivariate analysis between weight cycling prevalence and selected socio-

demographic variables among the study sample.

Socio-demographic factors						
Variable/Category	Total	Total Weight cycling prev		Test st	Test statistics	
	Ν	n	%	χ <sup>2</sup>	P-value	
Age ( in years)	-					
25-34	182	53	29.1			
35-44	101	23	22.8			
45-54	72	16	22.2	1.782	0.619	
55≤	29	7	24.1			
Type of locality			8	8		
Urban	213	60	28.3	9.068	0.110	
Rural	147	39	26.5			
Marital status			8	8		
Married	303	79	26.1			
Unmarried	81	20	24.7	0.064	0.801	
Educational level						
Secondary and below	127	28	22.0	1 383	0.240	
Associate diploma and beyond	257	71	27.6	1.565	0.240	
Employment						
Working	166	53	31.9			
Non-working	218	46	21.1	5.773	0.016	
Income level			8	8		
Less than 2000 ILS	49	9	18.3			
2000- less than 3500 ILS	225	65	28.9	5.085	0.166	
3500-5000 ILS	73	19	26.0			
More than 5000 ILS	37	6	16.2			

# **3.7.2 Physical health factors**

In this section, we will present the results of the associations between weight cycling and selected physical health factors including smoking status, the menstrual cycle status, and the selected health indicators: BMI, WC, and WHR.

**Table 3.7** shows the bivariate analyses between weight cycling and these selected

 physical health factors.

#### **Smoking status**

Smoking status was categorized into smoking (regular or irregular smoker) and non- smoking women (not currently a smoker and never been one). Smoking status was significantly associated with weight cycling (p-value=0.033). The results showed that non-smoking women had a higher prevalence of weight cycling (33%) when compared to smoking women (22%).

#### Having the menstrual cycle

The menstrual cycle status was significantly associated with weight cycling (p-value <0.001), and the highest prevalence of weight cycling was among women who had irregular menstrual cycle which was 44%. The lowest prevalence of weight cycling was among women who had a regular menstrual cycle (around 21%).

#### **Health indicators**

Weight cycling was significantly associated with BMI (p-value <.001), with the highest prevalence of weight cycling among overweight women (43%). In terms of other health indicators; WC was significantly associated with weight cycling (p-value=<0.001); the prevalence of weight cycling among women who had a WC

> 88 cm was about 31%. Regarding WHR, it was not significantly associated with weight cycling.

Health factors							
Variable/ category	Total Weight cyc		t cycling alence	Test s	Test statistics		
	Ν	n	%	χ <sup>2</sup>	P-value		
Smoking status *							
Smoking	254	57	22.4				
Non- smoking	130	42	32.6	4.569	0.003		
Having a menstrual cycle							
Yes, regular cycle	248	50	20.5				
Yes, but irregular	81	36	44.4				
Yes, with hormonal replacement therapy	6	2	33.3	18.634	<.001		
No	49	11	22.4				
Obesity prevalence (BMI) **			2				
Normal	130	11	8.5				
Overweight	127	55	43.3	93.921	<.001		
Obesity	113	33	29.2				
WC >88 cm	186	57	30.6	130.282	<.001		
WHR ≥ .85	215	42	19.5	0.842	0.359		

Table 3.7- Bivariate analysis between weight cycling and physical health factors.

\* Smoking status; smoking refers to women who are regular or irregular smokers of (cigarettes,

hookah, and electronic cigarette), and non-smoker refers to women who are not currently smokers and never smoked previously.

\*\* Normal (BMI= 18.5-24.9), overweight (BMI = 25-29.9), obese (BMI ≥30).

## 3.7.3 Mental health factors

The literature has suggested some mental factors that might be associated with weight cycling. The bivariate analyses between weight cycling and selected mental health factors of body image satisfaction, the possibility of eating disorders, and the perceived stress level among the study sample, are shown in **Table 3.8.** 

#### **Body image satisfaction**

Weight cycling prevalence among women who dissatisfied with their body image was around 54%. Women who dissatisfied with their body image had a higher prevalence of weight cycling compared to women who satisfied and sometimes satisfied with their body image. The association between weight cycling and body image satisfaction was significant (p-value <0.001).

#### The possibility of eating disorders

The possibility of eating disorders was significantly associated with weight cycling (49%); p-value <0.001). Women who were classified as possible cases of eating disorders had more weight cycling prevalence compared to women who were not classified as possible cases of eating disorders.

#### **Perceived stress level**

The highest prevalence (68%) of weight cycling was among the high - perceived stress level women compared to low and moderate perceived stress level women. This association between weight cycling and the perceived stress level was statistically significant (p-value <0.001).

Mental health								
Variable/Category	Total	Weight cycling prevalence		Test statistics				
	Ν	n	%	χ²	P-value			
Body satisfaction								
Yes	164	26	15.8	40.570	<0.001			
No	97	52	53.6					
Sometimes	123	21	17.1					
The possibility of eating disorder	rs	•						
Yes	192	94	49.0	202 898	<0.001			
No	192	5	2.6	202.070				
Perceived stress level								
Low-stress level	40	9	22.5					
Moderate stress level	304	63	20.7	42.789	< 0.001			
High stress level	40	27	67.5					

Table 3.8 Bivariate analyses between weight cycling and mental health factors.

# 3.8 Perceived weight status in the past 24 months

Bivariate analysis was also conducted between weight cycling and perceived weight status in the past 24 months. It was significantly associated with weight cycling (p-value<0.001). Women whose weight cycled in periods of losses and gains in the past 24 months had the highest weight cycling compared to women whose weight remained stable, decreased or increased in the past 24 months **Table 3.9**.

Perceived weight status in the past 24 months						
	Total	Weight cycling prevalence		Test statistics		
	Ν	n	%	χ²	P- value	
How do you describe your body v	veight in t	he past 24	months			
Remained stable the entire period	80	6	7.6			
Increased during the entire period	48	7	14.6			
Decreased during the entire period	94	12	12.8	60.211	<0.001	
Has cycled during periods of losses and gains in the entire period	162	74	45.7			

 Table 3.9- Bivariate analysis between weigh cycling and perceived weight status in the past

 24 months.

# 3.9 Detailed analysis

In this section, three bivariate analyses were conducted, each one was carried out between weight cycling and selected independent variable controlled by a third variable. These analyses carried out to increase our knowledge of weight cycling prevalence among the study sample characteristics.

## Weight cycling and BMI association controlled by age

The literature has suggested that BMI and age are associated with each other (BMI increases with age). Therefore, a bivariate analysis between weight cycling and BMI controlled by age was conducted because weight cycling association with BMI might be confounded by age. The results of this bivariate analysis revealed that weight cycling is significantly associated with BMI when controlled by age; the percentage of women with weight cycling increased with women's age especially among obese women **Table 3.10**.

Age categories	Weight cycling prevalence among normal	Weight cycling prevalence among overweight	Weigh cycling prevalence among obese	Test s	statistics
	%	%	%	χ²	P-value
25-34	4.7	21.2	4.1		
35-44	1.0	9.2	12.2	44.7	< 0.001
45-54	0.0	8.7	14.5		
55≤	0.0	10.3	13.8		

Table 3.10- Bivariate analysis of weight cycling and BMI controlled by age.

#### Weight cycling and BMI association controlled by smoking status

The relationship between weight cycling and BMI may also be confounded by smoking. The literature has shown that smoking and BMI are associated with each other. Therefore, a further bivariate analysis was conducted to test the relationship between weight cycling and BMI controlled by smoking status. The results showed that weight cycling was associated with BMI when controlled by smoking, and it is significantly (p-value<0.001) higher among non-smoking women compared to smoking women, especially among overweight and obese women **Table 3.11.**
Smoking Status	Weight cycling prevalence among normal	Weight cycling prevalence among overweight	Weight cycling prevalence among obese	Test st	atistics
	%	%	%	χ <sup>2</sup>	P-value
Smoking	6.1	33.8	28.4	24.4	<0.001
Non- smoking	8.3	55.2	33.3	21.1	

Table 3.11- Bivariate analysis of weight cycling and BMI controlled by smoking status.

# Weight cycling and the possibility of eating disorders controlled by body image satisfaction

Previous researches have indicated that there is a relationship between eating disorders, body image satisfaction, and weight cycling. So, a bivariate analysis was conducted between weight cycling and the possibility of eating disorders controlled by body image satisfaction. This analysis revealed that the highest significant proportion of weight cycler women (70%; p-value <0.001) who were classified as possible cases of eating disorders were dissatisfied with their body image **Table 3.12.** 

Table 3.12-Weight	cycling and the	possibility of eating	g disorders contro	olled by body image
satisfaction.				

Body image satisfaction	Weight cycling prevalence among who did not classify as possible cases of eating disorder	Weight cycling prevalence among possible causes of eating disorder	Test Statistic		
	%	%	$\chi^2$	P-value	
Yes	3.3	46.9	40 11	<0.001	
No	6.9	69.7	10.11	<0.001	
Sometimes	0.0	30.6			

## **3.10 Interactions between variables**

We used regression to test for the interaction between selected independent variables with the independent variable. The regression test was done here because we observed that the groups within one variable have different associations with the dependent variable as will be explained below.

Adding interaction term to the regression model can expand our understanding of the relationships among the variables in the model. An interaction effect may exist when the effect of BMI on weight cycling differ within the different age groups and different smoking status categories. Therefore, the first two regression analyses were carried out among weight cycling as the dependent variable with BMI interacted with age, and with BMI interacted with smoking status. The third regression was among weight cycling and the possibility of eating disorders interacted with body image satisfaction. The results showed that smoking and body image satisfaction had significant effects on the association between weight cycling and BMI **Table 3.13**. The main results of these regressions showed that young obese women were more likely to be weight cyclers, while obese older women were less likely to be weight cyclers. Also, overweight dissatisfied women with their body image were more likely to be weight cyclers compared to obese dissatisfied women, and overweight and obese women that sometimes satisfied with their body image.

 Table 3.13- Interaction regression between weight cycling and selected variables.

Independent	Adjusted OR	95% CI	Sig.
Variable/Category			
BMI* age group			
Normal*age group (24-34 years)	1		1
Overweight * age group (35-44	1.456	0.703-3.017	0.396
years)			
Overweight * age group (≥45	1.768	0.834-3.748	0.212
years)			
Obesity * age group (24-35	1.375	0.725-2.607	0.413
years)			
Obesity* age group ((≥45 years)	0.819	0.465-1.444	0.563
BMI * smoking status			
Normal* smoking	1		
Overweight*non- smoking	1.276	1.115-1.461	0.003
Obesity *non- smoking	1.113	1.012-1.260	0.012
BMI * body image satisfaction			
Normal* satisfied	1		
Overweight*dissatisfied	10.090	5.396-18.867	<0.001
Obese*dissatisfied	3.067	1.677-5.609	0.002
Overweight* sometimes	2.352	1.258-4.397	0.025
satisfied			
Obese* sometimes satisfied	0.749	0.291-1.920	0.614

# 3.11 Multivariate analysis

Multiple logistic regression model was adjusted for all the independent variables except for the income level and education level since it seemed they measure the same thing in this study. Therefore, we included the education level and excluded the income level based on their effect on the model assessed by the -2-likelihood ratio. For the abdominal fat, WHR was not included because it was not significantly associated with weight cycling in the bivariate analysis and we included WC, which was significant with weight cycling. The rationale for this step is that WC and WHR (as indicators of abdominal fat) were both correlated with BMI, but this level of correlation varies and each correlation may provide different information and cannot be used alternatively. Practical considerations appeared to favor the use of WC as an alternative to BMI; WC may be easier and more accurate than measuring weight and height. In addition, when comparing WC measurement to WHR, the latest may be more difficult to measure than WC alone; this could limit the potential use of WHR as an alternative to either WC or BMI.

It is worth mentioning that some variables were recoded into fewer categories than used in the bivariate analysis. This was done to help us understand the real relationships between the independent variables with the dependent variable, and to obtain a strong robust model **Table 3.14**.

The results of the multivariate analysis revealed that the main factors associated with weight cycling in this study sample were: marital status, smoking status, BMI, WC > 88 cm, perceived weight status in the past 24 months, the possibility of eating disorders, and body image satisfaction.

Marital status was significantly associated with weight cycling (OR= 1.251, 95% CI= 1.107-3.591, p-value=0.008); women who were married had a higher likelihood to experience weight cycling than unmarried women. Non-smoking women had a higher likelihood to be weight cyclers compared to smoking women (OR= 2.896, 95% CI= 1.157-7.248, p-value=0.003).

The results of regression also showed that women who were overweight and obese had higher odds of being weight cyclers compared to normal-weight women (OR= 8.319, 95% CI=2.831-24.449, p-value=0.001 and OR =6.646, 95% CI=1.943-22.732, p-value=0.011, respectively). Women who had WC > 88 cm were more likely to be weight cyclers compared to women who had WC  $\leq$  88 cm (OR=5.838, 95% CI=1.826-18.669, p-value=0.003).

Women who perceived their weigh as cycled in the past 24 months, were more likely to be weigh cyclers compared to those who perceived their weight as the same pattern of weight change (remained stable, decreased, or increased weight) (OR= 3.934, 95% CI=2.078-7.448, p-value<0.001). For mental health factors, body satisfaction was significantly associated with weight cycling, and women who dissatisfied and sometimes satisfied with their body image had a higher odds to be weight cyclers than women who satisfied with their body image (OR=6.070, 95% CI=2.444-15.075 and OR=2.716-, 95% CI=1.207-6.189, respectively).

The possibility of eating disorders was also significantly associated with weight cycling; women who were classified as possible cases of eating disorders had a

higher likelihood to be weight cyclers than women who were not classified as possible cases of eating disorders (OR= 2.46, 95% CI=1.27-2.02, p-value=<0.001). While body image satisfaction and the possibility of eating disorders remained significant for weight cycling in the regression model, the perceived stress level variable was no longer significant to be associated with weight cycling.

 Table 3.14- Univariate (unadjusted odds ratio) and multivariate (adjusted odds ratio) logistic

 regression model for weight cycling and the selected independent variables.

Independent	Unadjust	95% CI	Sig.	Adjusted	95% CI	Sig.	
Variable/Category	ed			OR			
	OR						
Age groups (ref:25-34)							
25-34	1			1			
35-44	0.839	0.514-1.371	0.557	0.992	0.428-2.299	0.987	
45≤	0.828	0.383-1.791	0.687	4.305	0.728-25.465	0.177	
Type of locality (ref: urban)	<u> </u>						
Urban	1			1			
Rural	0.915	0.615-1.360	0.712	1.135	0.569-2.263	0.763	
Marital status (ref: non-marrie	<b>d</b> )			•			
Unmarried	1			1			
Married	1.109	1.686-1.792	0.012	1.251	1.107-3.591	0.008	
Educational level ( ref: seconda	ry and below	)				I	
Secondary and below	1			1			
Associate diploma and beyond	0.835	0.654-1.324	0.421	1.799	0.835-3.876	0.209	
Smoking status (ref: smoking)							
Smoking	1			1			
Non- smoking	0.626	1.042-1.938	0.036	2.897	1.857-4.248	0.002	
Having a menstrual cycle (ref:	Having a menstrual cycle ( ref: yes, regular/ irregular period)						

Yes, regular and irregular	1			1			
period							
No. It do not have my period,	0.816	0.464-1.437	0.555	0.704	0.221-2.246	0.916	
and come with hormonal							
replacement therapy							
BMI ( ref: normal)	1		I				
Normal	1			1			
Overweight	10.270	5.415-10.479	<0.001	8.319	2.831-24.449	0.001	
Obesity	5.546	2.859-5.756	< 0.001	6.646	1.943-22.732	0.011	
Central obesity WC ( ref: WC≤	588 cm)						
$WC \le 88 \text{ cm}$	1			1			
WC > 88 cm	1.244	1.840-2.843	0.359	5.838	1.826-18.669	0.003	
Perceived weight status in the	past 24 mont	hs (ref: the same pa	ttern of wei	ight change;	remained stable,	decreased or	
increased)							
The same pattern of weight	1			1			
change; remained stable,							
decreased or increased)							
Has cycled in periods of losses	10.231	4.856-21.555	< 0.001	3.934	2.078-7.448	< 0.001	
and gains in the entire period							
Body image satisfaction							
Yes	1			1			
No	5.049	3.107-8.205	<0.001	6.070	2.444-15.075	< 0.001	
Sometimes	1.123	0.665-1.895	0.716	2.716	1.207-6.189	0.003	
The possibility of eating disorders (ref: no)							
No	1			1			
Yes	12.873	4.407-10.436	< 0.001	2.46	1.271-2.022	< 0.001	
Perceived stress level (ref: low perceived stress level)							
Low perceived stress level	1			1			
Moderate perceived stress level	1.351	0.626-2.916	0.521	0.571	0.154-2.114	0.401	
High perceived stress level	10.731	4.276-26.928	< 0.001	1.308	0.223-7.670	0.766	

Odds Ratio (OR) and Confidence Intervals (CIs) for associated factors with weight cycling; Columns 2, 3& 4

represent results from the unadjusted model; Columns 5, 6& 7 represent results from the adjusted model for

all variables; the significance level < 0.05

The final step of the multivariate regression analysis was to put all the factors that were significantly associated with weight cycling in the previous regression model together in addition to age in one model. Wald test was used in this model to explore the best variables (predictors) that predict the outcome variable (weight cycling). This regression model showed that BMI, perceived weight status in the past 24 months, and the possibility of eating disorders were the best predictors of weight cycling. The variables in this final model will be interpreted in the discussion section since they were significantly associated with weight cycling

# Table 3.15.

 Table 3.15- Final regression model between weight cycling and the significant associated factors.

Independent Variable/Category	Adjusted OR	95% CI	Sig.	
Age groups(ref: 24-34 years)	011			
24-35 years	1			
35-44 years	0.950	0.440-2.051	0.912	
$\geq$ 45 years	1.749	0.722-4.233	0.298	
Marital status (ref: non-married)			1	
Non- married	1			
Married	1.291	1.130-2.615	0.002	
Smoking status (ref: smoking)				
Smoking	1			
Non-smoking	1.526	1.526-2.756	0.022	
BMI (ref: normal)			1	
Normal	1			
Overweight	5.726	2.339-14.016	0.001	
Obese	3.147	1.051-9.242	0.015	
(ref: WC ≤ 88 cm)		·		
$WC \le 88 \text{ cm}$	1			
WC> 88 cm	1.607	1.749-3.447	0.006	
Perceived weight status in the past 2	4 months (ref: the s	ame pattern of weight (	change; remained	
stable, decreased or increased)				
The same pattern of weight change;	1			
remained stable, decreased or				
increased)				
Has cycled in periods of losses and	4.637	2.544-8.450	<0.001	

gains in the entire period						
Body image satisfaction (ref: yes)						
Yes	1					
No	2.952	1.957-3.984	0.003			
Sometimes	1.468	1.224-1.979	0.012			
A possible case of eating disorders (ref: no)						
No	1					
Yes	6.689	3.156-17.485	0.001			

Odds ratio (OR) and Confidence Intervals (CIs) for associated factors with weight cycling; Columns 2, 3& 4 represent results from the unadjusted model; Columns 5, 6& 7 represent results from the adjusted for the significant variables with age model; the significance level < 0.05.

# 3.12 Qualitative question for weight cyclers: What are the most frequent diets that weight cyclers followed, and what are the most common reasons to follow these diets?

Although we conducted a quantitative study, we had an open-ended question to ask women about the most frequent diets they followed and the reasons to start dieting. This could help us to catch any extra information that was not captured by the structured questions. Below is a summary of the main points mentioned by weight cycler women.

Regarding the most frequent diets, we identified two general themes related to the types of diets and dieting practices that followed, and the reasons to start dieting.

#### Theme 1: Healthy diets and behaviors

The most common healthy diets were those provided by the specialized nutritionists, while the healthiest behaviors were moderate exercising and drinking plenty of water. One common subtheme (reason) was identified under this theme:

## Subtheme 1.1: Improving health

We concluded that the most common reason to follow healthy diets and behaviors was to improve woman's health; this reason affected her decision to start following these healthy dieting behaviors.

# Theme 2: Unhealthy diets and behaviors

The most two common unhealthy diets mentioned were very low calorie (restricted diets) and keto diets. Regarding the most common unhealthy dieting behaviors were excessive exercising and using diet pills. There were three subthemes related to this theme:

# Subtheme 2.1: Unhealthy diets and behaviors guided by a person who claimed he/she is a nutritionist

Firstly, the persons who claim that they are nutritionists do not have a scientific qualification in nutrition to plan diets for people. Mainly, such persons depend on several dieting products to sell, which are usually harmful to a person's health, and provide diets that are not scientific-based.

"I followed a carb-free diet, which was depending on having one meal with very low calories. I felt tired and deprived my body of the essential nutritional needs, but I continued because that person promised me that I will lose much weight in a short period if I followed that diet." (28 years old woman, weight cycler)

# Subtheme 2.2: Unhealthy diets and behaviors undertaken by the woman herself

Some women said that they followed these unhealthy diets and behaviors without consulting any qualified person to lose their extra weight.

"I had checked-up my body weight and felt upset and dissatisfied with my body shape, and then I bought weight loss pills without any prescription from a qualified person and took them spontaneously. This way did not work, and the few kilos I lost, if not more, I regained." (32 years woman, weight cycler)

## Subtheme 2.3: Body image dissatisfaction

Body dissatisfaction was the most common reason among women who reported that they followed unhealthy dieting behaviors.

# **CHAPTER FOUR:**

# DISCUSSION

# 4.1 Weight cycling prevalence

In this study, we aimed to estimate the prevalence of weight cycling, and explore the associated factors among a sample of women who attended four selected non-governmental medical centers in the Ramallah and al- Bireh Governorate. Exploring weight cycling prevalence and the associated factors is important in developing future interventions and policies that targeted the exposed populations to weight cycling as women. The main study findings indicated that the prevalence of weight cycling among the study sample was 25.8%. Thus, weight cycling seemed to be a prevalent phenomenon among women in the Ramallah and al- Bireh Governorate. This is comparable to the international literature is consistent with the range of weight cycling prevalence among women, which was estimated at 20-55% [9, 77-80].

The ability to compare weight cycling prevalence of our study with the other studies is limited because there is no clear and standard definition of weight cycling [40]. Therefore, the estimated prevalence of weight cycling in this study will be higher than some studies and lower than others based on the criteria used to assess weight cycling.

Our study prevalence of weight cycling was higher than others in the literature [9, 78]. This is because the categorization of weight cyclers in the studies that had lower prevalence of weight cycling than ours. As an example, some of these

studies categorized weight cyclers into severe and moderate weight cycling with different criteria for each category. The prevalence of weight cycling in such studies depended on the proportion of severe weight cyclers. In our study, we used the same criteria for all the participants, thus severe and moderate weight cyclers fall under the same category. As a result, the numbers of weight cyclers that are included in our study will be higher than the studies that categorized weight cycling into several categories. It is worth mentioning that our criteria for weight cycling almost underlined the moderate weight cycling category that used in the studies which have lower prevalence of weight cycling than this study prevalence.

In addition, the studies that had a lower prevalence of weight cycling than ours put more restrictions on the definition of weight cycling. They used cut-off points of kilograms with precise digits (not integer) that are relatively hard to remember by the participant. Therefore, these studies may catch less number of weight cyclers than in our study, which used an integer number of kilos to lose and regain.

In conclusion, weight cycling categorization and using very detailed criteria of weight cycling, made such studies to have higher prevalence of weight cycling than our study prevalence.

On the other hand, the prevalence of weight cycling in some studies was higher than in this study. This is because the authors used a more liberal definition of weight cycling, without quantifying the kilos lost and regained. As an example; Did you previously lose and regain weight?. In addition, some studies with the higher prevalence of weight cycling than ours, depended on the participants if they perceived themselves as weight cyclers, as an example; Do you perceive yourself as a weight cycler?. However, in our study, we can depend on the percentage of women who perceived their weight as cycled as the prevalence of weight cycling when compared with the studies that used the same criteria. In this study sample, 42% of women perceived their weight as cycled in the previous 24 months. This percentage could reflect weight cycling prevalence which is almost in the range of weight cycling prevalence in the studies that used the same criteria.

Actually body weight perception could be a useful tool to assess weight change and indicate dieting behaviors than actual weight. Body weight perception refers to the evaluation of one's weight as irrespective of actual weight or BMI [193, 194]. Generally, females are more inclined to perceive themselves as overweight and engage in undue dieting behaviors [195, 196]. Body weight perception helps to understand dieting behaviors regardless if they are healthy or unhealthy dieting behaviors [197]. The concern is about unhealthy dieting behaviors that have potential harmful health consequences for people who misperceived their body weight. These unhealthy dieting behaviors mainly related to body weight misperception regardless if the person perceived himself slimmer or fatter than the actual weight. Body weight misperception leads to frequent dieting and consequently weight cycling [198, 199].

Since body weight perception might indicate dieitng behaviors more than the actual body weight or BMI [111, 199, 200], the percentage of women who

perceived their weight as decreases, increased or cycled in this study could be useful to estitmate dieitng behaviors. In this study, 79% of women perceived their weight as decreased, increased, or cycled. This percentage emphasized the importance of the interventions that should increase women awareness to avoid unhealthy dieting behaviors when engaged in dieitng. Increasing the awareness on how women should perceive their weight, and engage in healthy dieting behaviors when they want to lose weight is a priority. Such interventions sound to be important since there was an indication that the perception of body weight as too fat, was an influential factor in following unhealthy diets to lose weight, especially in the young age in the oPt [4].

When compared our study weight cycling prevalence with the others in the Middle East countries, unfortunately, there were no studies so far that have focused on weight cycling in the region. However, it is worth mentioning that dieting behaviors were studied, especially among schoolchildren and adolescents. Recent studies in the Middle East found that the prevalence of unhealthy dieting behaviors was 10.8% and 6.1% among women and young females [152, 200]. Regarding Palestine, a recent study aimed to explore dieting practices of female Palestinian college students. This study found that 23.6% of females often used unhealthy dieting behaviors such as skipping meals in order to lose weight [18]. A higher prevalence (58%) of unhealthy dieting behaviors was found among university female students in the Gaza Strip [201].

Another study of dieting behaviors among overweight, normal weight, and underweight Palestinian adolescents, found that dieting to lose weight was common among them. Also, the authors of this study found that dieting was significantly higher among overweight than among underweight or normal-weight adolescents. More importantly, the results of this study showed that unhealthy dieting behaviors as vomiting, using diet pills, and laxatives were common, and younger adolescents were more likely to engage in these dieting behaviors than older adolescents [4].

These findings on unhealthy dieting behaviors among the young age groups in the oPt lead for further inquiry about the reasons for dieting, and to what extent the attempts to lose weight were successful. This will help to shed the light on weight cycling and the associated factors in our context.

# 4.2 Weight cycling associated factors

#### 4.2.1 Socio-demographic factors

Concerning the second objective of this study, we expected that marital status would be associated with weight cycling, and there was a significant relationship between them. This relationship was in line with the international findings, which have found that married women have higher odds of being weight cycler compared to unmarried women [126, 128, 129, 202, 203]. A survey that examined weight cycling before and after four years follow –up interval of being married; the authors found a positive relationship between weight cycling and being married during the following up interval. It is noticed that women experienced weight cycling after getting married when compared with their single status [202]. The nature of this association between marital status and weight cycling may be multi-faceted. Jeffry *et al.* reported in his study that the spouse

participant's weight was cycled over two years of following up. He provided a possible explanation of the relationship between being married and weight cycling. He suggested that marriage might increase the possibility of eating because married people tend to eat together, and engage in dieting together.

Another explanation of the association between weight cycling and marital status in terms of our culture is noteworthy. In the Arab countries as in Palestine, plumpness is preferred among people mainly for sexual attraction [204]. In addition, married women's extra weight reflects the wealth of her husband, and the security she feels when she gets married. As a result, married women would have a higher BMI, which in turn leads the woman to start dieting since increased BMI is associated with dieting and weight cycling.

In our study, the relationship between marital status and BMI is shown in the cross-tabs analysis among these variables **Annex 4.a**. The result revealed that marital status and BMI were significantly associated with each other; married women had a significantly higher prevalence of being overweight and obese compared to unmarried women.

If we broaden the explanation, marriage and weight cycling are also mediated by getting pregnant. Dieting is relevant for women who gained excessive weight during pregnancy, and critical for those who were overweight or obese at the beginning of pregnancy[205]. More interestingly, the international literature found that pregnant women who experienced weight cycling before pregnancy, have a slightly higher weight gain during pregnancy than pregnant women who did not experience weight cycling before their pregnancy. Furthermore, the

authors noted that pregnant women who used to follow healthy dieting behaviors as having regular breakfast, are more likely to retain their pre-pregnancy weight than women who follow unhealthy dieting behaviors during pregnancy [206]. In our Palestinian context, the relationship between weight cycling and marriage is endorsed by several cultural beliefs. "Eat for two", is a cultural Palestinian belief that encourages pregnant women to eat much more than recommended to stay good and healthy with her baby. This increase in weight might encourage woman after pregnancy to start dieting to lose her extra weight.

In conclusion, the relationship between weight cycling and marital status is possible; weight cycling is more prevalent among married women than unmarried. This relationship could be explained by the Palestinian cultural thoughts related to marriage and pregnancy.

## **4.2.2 Physical health factors**

For the fourth objective of this study; the main physical health factors that are associated with weight cycling are: smoking status, BMI, and WC.

For smoking status, the prevalence of non-smoking women (66%) was much higher than the prevalence of smoking women. This result was expected since the prevalence of non- smoking women is higher than smoking women globally [207]. In Palestine, the number of smoking women has increased, but according to our Palestinian context, the prevalence of smoking among women could be underestimated. This is due to cultural and social factors as smoking not very acceptable among women.

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The data of our study revealed that women who stated they are not smoking (previous smokers or never smoking), had higher odds than smoking women to be weight cyclers. This result is in concordance with the international literature, which has suggested that being non-smoker has been associated with weight loss and regain when compared to their smoking peers [208, 209].

The relationship between weight cycling and non-smoking could be interpreted in line with the previous research, which has found that smokers have lower body weight than non-smokers. This is due to the effect of smoking on the metabolic rate of the smoker [210]. Our study results support this finding; it is found that smoking prevalence was higher among normal-weight women compared to overweight and obese women (**Annex 4.b**).

To control any confounder on the association between weight cycling and being non- smoker in our study sample, we controlled this relationship with the educational level. Smoking might be associated with educational level; people who had a high educational level had less probability of being smokers. The result of this analysis showed a significant relationship between weight cycling and being non- smoker when controlled by education level. This partly explains, in our study sample, that weight cycling is associated with being non-smokers regardless of the education level.

#### BMI

Weight cycling health consequences have been widely studied, but the major concerns of weight cycling adverse harmful effects remain in a possible BMI and fat mass increase [174]. The significant relationship between weight cycling and BMI in our sample seems to be consistent with several findings of the literature [165, 211, 212], which have associated weight cycling with increased BMI.

Due to most of weight cycling studies are cross-sectional, the relationship between weight cycling and BMI is considered as a bidirectional. We cannot conclude if weight cycling leads to a higher BMI or a higher BMI leads to weight cycling. However, Emanuele *et al.* noted that the history of weight cycling is related to excess body weight and higher BMI. The magnitude of this BMI increase that follows weight cycling period remains under debate, but some studies showed a return to a baseline BMI [78, 213]. Another study of weight cycling as a predictor of subsequent two years weight change in a middle-aged cohort [213], found that weight cycling was a strong predictor of subsequent large weight gain in this period. There is no clear explanation for this relationship, but an early study provided a possible clue that weight cycling affects body metabolism rate leading to weight increase later in life [39, 174].

These data on weight cycling and BMI call for the need to thorough weight history and dieting assessment when planning diets by the nutritionist. This assessment is more important among overweight and obese individuals, since their body's metabolic rate might be declined due to weight cycling history [79]. This will add a new aspect to weight loss programs provided by the nutritionists in our country. They should to tackle dieting attempts to lose weight which would help to understand why some patients do not lose weight easily as others. In terms of abdominal fat, in our study sample, WC was positively associated with weight cycling. This is consistent with the international literature [172, 176, 226, 227], which has indicated that weight cycling is related to increased abdominal fat among women. Wallner et al. provided an explanation for this relationship between weight cycling and the abdominal fat. He suggested that weight cycling might cause a redistribution of body fat to the upper body fat compartments, not only among overweight women but also among normal-weight women. Repeated cycles of weight loss and regain in weight cycling, may be related to abdominal fat and long-term negative health [228].

Abdominal fat indicators in this study were WHR and WC. However, the significant association between weight cycling and abdominal fat is reflected only in WC (p-value= 0.006). This association of weight cycling and WC is justified by the previous research. Most of the studies have concluded that WC is probably a better indicator of abdominal fatness and health risks than either BMI or WHR [211, 229-232]. It is suggested that WHR is considered with no biological meaning, and it is not useful to reflect fat distribution or health better than WC alone [233], and this supports our study findings.

In our sample, it is noteworthy that 48% of women had a WC>88 cm, which is considered a hight percentage of women at risk for abdominal obesity hence other health problems. This calls for the development of interventions to control the factors that enhance abdominal obesity, and based on our study results; weight cycling might be one of these factors that provoke abdominal fat.

#### 4.2.3 Eating disorders and body image satisfaction

The finding of our study which is related to the third objective regarding the mental health factors, showed that the possibility of eating disorders, and body image satisfaction were significantly associated with weight cycling in the final regression model.

In terms of eating disorders; women who are classified as possible cases of eating disorders have a higher likelihood of being weight cyclers than those who not classified as possible cases of eating disorders. This finding replicates and extends the findings of earlier studies [214-216] that have associated weight cycling with eating disorders. The nature of this association is not clear, but it is found a crosssectional relationship between weight cycling and mental health. This relationship is due primarily to poorer psychological function preceding weight cycling [217]. Consistently, it was found that higher baseline scores of mental health indicators, as higher levels of depressive symptomatology and binge eating were associated with more subsequent weight cycling [218]. It is also hypothesized that eating disorders start with dieting behaviors that may evoke no concern, but after a while weight loss is induced by avoiding food especially fatty food, and sometimes accompanied by excessive exercising or self-induced vomiting, and taking laxatives. Within these periods of unhealthy dieting and later periods of recovering, weight cycling develops among people with eating disorders [219]. The association between eating disorders and weight cycling in this study could be interpreted by the other mental factor, which is body image dissatisfaction. The

international literature has shown that body image dissatisfaction, eating

disorders, and weight cycling have been associated with each other [214-216]. Our findings of crosstabs between body image satisfaction and the possibility of eating disorders, revealed that they are significantly associated with each other (p-value=<0.001) **Annex 4.c.** In addition, the results of detailed analysis in this study between weight cycling, body image satisfaction, and eating disorders, have accositaed these factors with each other. It is found a significant high rate of weight cyclers women who dissatisfied with their body image, they classified as possible cases of eating disorders. This association might be interpreted by the expalantion of that weight cycling affects the strength of the relationship between body image dissatisfaction and eating disorders. Body image dissatisfaction leads to eating disorders, which in turn may lead to weight cycling [215].

In our country, although plumpness is preferred, but recently mass media appeared to influence women's body image perception and satisfaction as in some of the Arab countries. It was found that the impact of mass media to encourage thinness might lead to body image dissatisfaction which most of the times lead to follow unhealthy dieting behaviors [217]. Modern media technologies as the internet and the easy access to it, exposed women to western programs with the depictions of slimness as a beauty feature. This leads to an increase in the prevalence of body image dissatisfaction and eating disorders among women [218].

A further detailed investigation that focuses on the role of media on body image satisfaction is needed to understand the relationship between weight cycling and mental factors.

#### Strengths of the study

This was the first study of its kind to assess the prevalence of weight cycling and the associated factors among women in the Ramallah and al Bireh Governorate. Therefore, this study may be used as a reference to estimate the current prevalence of weight cycling among women and shed the light on the main associated factors that may be related to weight cycling. It is worth mentioning that the current study design did not aim to be a representative sample, but rather it is an explorative study in weight cycling among women. In addition, this study will complement the previous studies findings related to dieting behaviors conducted in the oPt, and provide additional data on the entire dieting process.

In addition to that, this study was the first to address weight cycling, it is also the first study that validated weight cycling assessment tool. This tool could be a good reference for the following weight cycling studies since we were testing and validating it by back translation and piloting.

This study has also reported the prevalence of other secondary important variables as smoking status, eating disorders, perceived stress level, and obesity among the targeted population. These findings could be useful to compare with and complement other research findings concerning these variables in the oPt.

#### Limitations of the study

Several limitations in this study need to be taken into consideration. It is a crosssectional study that can only draw an association but not infer any causation and generalization. In addition, participation in the study was based on self-selection, which has an inherent bias in the characteristics of the non-respondents. Our study is limited to one governorate which is exposed to the world more than any other Palestinian governorates. The sampling was limited only to women who visited the selected medical centers that might be different from the other women in other settings.

Although this study had these limitations, it sheds the light on an important public health issue regarding weight cycling prevalence among women in the Ramallah and al – Bireh Governorate. The results of this study have many suggestions that can be introduced to policy-makers in all sectors and the nutritionists to guide future intervention programs.

# Recommendations

From my experience as a nutritionist and recently as a public health nutritionist, I would like to propose practical recommendations that would help me at the individual level and help the health system at the national level. The study recommendations will be introduced based on the planned behavior theory.

These study recommendations will be reflected based on the theory of planned behavior as the following:



Figure 4.1- Planned behavior theory.

As shown in this figure, starting a diet is endorsed by three factors; the internal motivation to lose weight, the perceived subjective norm in the social environment to lose weight, and the belief of a woman that she will lose her weight when following a diet.

Attitude towards the behavior: The internal motivation to be slimmer and healthier is triggered by dissatisfaction with the body. Being dissatisfied with the body is confirmed by the literature to affect internal motivation [108, 220]. Body image dissatisfaction starts at a young age and is very common among females [220]. The interventions that could be introduced here involve mass media contribution, which should ensure the quality of materials they introduce regarding health and weight. On the other hand, avoiding any harmful content that promotes unhealthy dieting behaviors, and encouraging people in the community to refer weight-related issues to the professionals and the specialists.

Subjective norm: The subjective norm is in which the woman perceives from her social environment that she should lose her extra weight. Comments from family and friends about the extra weight and their recommendations to follow a certain diet, will enhance the belief to lose weight and to be slimmer. The influence of the social environment on starting the diet is acknowledged by literature [221].

Our recommendation here is to develop interventions that target the community especially women, to increase their awareness regarding the cultural and social myths related to weight concerns during marriage and pregnancy. The nutritionists should play a role on behalf of their community participation. For example; conducting awareness lectures among women to change their misleading beliefs regarding weight gain and weight loss.

Perceived behavioral control: This is influenced by beliefs on the ease or difficulty of behavior that exists out of the trends in dieting. A study by Leske (2012) has found that women are vulnerable to engage in dieting trends because they believe such diets will help them to lose weight [222]. Further research is recommended to explore what are the trends in dieting that are more prevalent among women in the oPt and why.

We propose an intervention here to the nutritionist in different settings to educate the clients about the advantages and disadvantages of the new trends of diets. The qualitative data of this study indicated to some trends in dieting among the sample. Keto and unplanned diets were the most common among weight cycler women. These diets appeared to have some implications; therefore, further research should address the trends in dieting, and the results should be shared and communicated with the community to benefit them.

To summarize the above recommendations, I would recommend the following:

 Provide leadership for healthy weight and lifestyle as a part of the national policy agenda that provides the reference policy framework for all ministries and governmental bodies. This also includes the MOH to monitor the practice of the nutritionists and to stop the illegal practice of people who claim to be nutritionists. The MOH should also supervise the illegal distribution of dieting pills.

Media is also an important part here. Ensuring the content that will be introduced to the audience will promote healthy dieting behaviors to lose weight and avoid unhealthy ones among them is a priority.

2) The Palestinian Dietitians Syndicate should always track the practices of the nutritionists, and inform them about the latest researches on dieting behaviors. Community lectures by the qualified nutritionists that guided by the Palestinian Dietitians Syndicate should systematically be conducted in all age groups in the community. Such lecturs can help to raise the awareness among people on how to correctly perceive their weight and assess BMI status. In addition, the nurtitionists should educate people how they should seek the help and choose healthy dieting behaviors if any weight and body issues exist.

#### References

- World Health Organization. Obesity and overweight. 2018; Available from: https://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight.
- Reilly, J.J., et al., *Health consequences of obesity*. Archives of disease in childhood, 2003. 88(9): p. 748-752.
- Musaiger, A.O., et al., Change in nutrition and lifestyle in the Eastern Mediterranean Region: Health impact. Journal of nutrition and metabolism, 2012.
   2012.
- Power, M.L. and J. Schulkin, Sex differences in fat storage, fat metabolism, and the health risks from obesity: possible evolutionary origins. British Journal of Nutrition, 2008. 99(5): p. 931-940.
- Fisher, M.L. and M. Voracek, *The shape of beauty: determinants of female physical attractiveness*. Journal of Cosmetic Dermatology, 2006. 5(2): p. 190-194.
- Williams, L., J. Germov, and A. Young, Preventing weight gain: a population cohort study of the nature and effectiveness of mid-age women's weight control practices. International Journal of Obesity, 2007. 31(6): p. 978-986.
- 7. van de Pol, E., Weight cycling and women. 2015.
- 8. Drenick, E.J. and D. Johnson, *Weight reduction by fasting and semistarvation in morbid obesity: long-term follow-up.* International journal of obesity, 1978.
- 9. Lahti- Koski, M., et al., *Prevalence of weight cycling and its relation to health indicators in Finland*. Obesity research, 2005. **13**(2): p. 333-341.
- Rhee, E.-J., Weight cycling and its cardiometabolic impact. Journal of obesity & metabolic syndrome, 2017. 26(4): p. 237.

- Field, A.E., S. Malspeis, and W.C. Willett, Weight cycling and mortality among middle-aged or older women. Archives of internal medicine, 2009. 169(9): p. 881-886.
- Petersmarck, K.A., et al., *The effect of weight cycling on blood lipids and blood pressure in the Multiple Risk Factor Intervention Trial Special Intervention Group.* International journal of obesity, 1999. 23(12): p. 1246-1255.
- Osborn, R.L., et al., *Yo-yo dieting in African American women: weight cycling and health*. Ethnicity & disease, 2011. 21(3): p. 274.
- 14. Pacanowski, C.R., et al., *Psychological status and weight variability over eight years: Results from Look AHEAD.* Health Psychology, 2018. **37**(3): p. 238.
- 15. Elessi, K. and L. Albaraqouni, *Prevalence of obesity and overweight in Palestine: a systematic review*. The Lancet, 2019. **393**: p. S20.
- 16. Al Sabbah, H., et al., Weight control behaviors among overweight, normal weight and underweight adolescents in Palestine: Findings from the national study of Palestinian schoolchildren (HBSC- WBG2004). International Journal of Eating Disorders, 2010. 43(4): p. 326-336.
- Al Sabbah, H., et al., Food habits and physical activity patterns among Palestinian adolescents: findings from the national study of Palestinian schoolchildren (HBSC-WBG2004). Public health nutrition, 2007. 10(7): p. 739-746.
- Bayyari, W., L. Henry, and C. Jones, *Dieting behaviours, obesity and predictors of dieting among female college students at Palestinian universities*. EMHJ-Eastern Mediterranean Health Journal, 19 (1), 30-36, 2013, 2013.
- 19. Bayyari, W.D., Predictors of dieting among female college students at Palestinian universities: An exploratory study. 2010: University of Arkansas.

- 20. Montani, J.P., Y. Schutz, and A.G. Dulloo, *Dieting and weight cycling as risk factors for cardiometabolic diseases: who is really at risk?* Obesity Reviews, 2015.
  16: p. 7-18.
- Madigan, C.D., et al., *Is weight cycling associated with adverse health outcomes? A cohort study.* Preventive medicine, 2018. 108: p. 47-52.
- Matteucci, A.J. and M. Lowe, *Dieting*. The Wiley Blackwell Encyclopedia of Gender and Sexuality Studies, 2016: p. 1-3.
- 23. Heart, N., et al., *Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults: the evidence report.* 1998: National Heart, Lung, and Blood Institute.
- 24. General, O.o.t.S. and N.I.o. Health, *The Surgeon General's call to action to prevent* and decrease overweight and obesity. 2001.
- 25. General, U.S.P.H.S.O.o.t.S., et al., *Physical activity and health: A report of the Surgeon General.* 1996: US Department of Health and Human Services, Centers for Disease Control and ....
- McManus, K., L. Antinoro, and F. Sacks, A randomized controlled trial of a moderate-fat, low-energy diet compared with a low fat, low-energy diet for weight loss in overweight adults. International journal of obesity, 2001. 25(10): p. 1503.
- Harvey- Berino, J., *The efficacy of dietary fat vs. total energy restriction for weight loss*. Obesity research, 1998. 6(3): p. 202-207.
- Bish, C.L., et al., Diet and physical activity behaviors among Americans trying to lose weight: 2000 Behavioral Risk Factor Surveillance System. Obesity research, 2005. 13(3): p. 596-607.
- Kruger, J., et al., Attempting to lose weight: specific practices among US adults. American journal of preventive medicine, 2004. 26(5): p. 402-406.

- Tsai, A.G. and T.A. Wadden, Systematic review: an evaluation of major commercial weight loss programs in the United States. Annals of internal medicine, 2005.
   142(1): p. 56-66.
- Harring, H.A., K. Montgomery, and J. Hardin, *Perceptions of body weight, weight management strategies, and depressive symptoms among US college students.* Journal of American College Health, 2010. **59**(1): p. 43-50.
- 32. Davila, E., et al., *Relationships between depression, gender, and unhealthy weight loss practices among overweight or obese college students.* Eating behaviors, 2014.
  15(2): p. 271-274.
- Kelly- Weeder, S., et al., *Binge eating and weight loss behaviors of overweight and obese college students*. Journal of the American Association of Nurse Practitioners, 2014. 26(8): p. 445-451.
- Eisenberg, D., et al., Eating disorder symptoms among college students: Prevalence, persistence, correlates, and treatment-seeking. Journal of American College Health, 2011. 59(8): p. 700-707.
- 35. Brownell, K.D., et al., *Understanding and preventing relapse*. American psychologist, 1986. **41**(7): p. 765.
- Kajioka, T., et al., *Effects of intentional weight cycling on non-obese young women*.
   Metabolism-Clinical and Experimental, 2002. 51(2): p. 149-154.
- Vidal, J., Updated review on the benefits of weight loss. International Journal of Obesity, 2002. 26(S4): p. S25.
- Wing, R.R. and S. Phelan, *Long-term weight loss maintenance*-. The American journal of clinical nutrition, 2005. 82(1): p. 222S-225S.
- Brownell, K.D., et al., *The effects of repeated cycles of weight loss and regain in rats*. Physiology & behavior, 1986. 38(4): p. 459-464.

- 40. Atkinson, R.L., et al., Weight cycling. JAMA, 1994. 272(15): p. 1196-1202.
- Montani, J.-P., et al., Weight cycling during growth and beyond as a risk factor for later cardiovascular diseases: the 'repeated overshoot'theory. International journal of obesity, 2006. 30(S4): p. S58.
- Meltzer, A.A. and J.E. Everhart, Self- reported substantial 1- year weight change among men and women in the United States. Obesity research, 1995. 3(S2): p. 123s-134s.
- Haus, G., et al., Key modifiable factors in weight maintenance: fat intake, exercise, and weight cycling. Journal of the American Dietetic Association, 1994. 94(4): p. 409-413.
- 44. Womble, L.G., et al., *Psychosocial variables associated with binge eating in obese males and females*. International Journal of Eating Disorders, 2001. **30**(2): p. 217-221.
- 45. Resnick, H.E., et al., *Relation of weight gain and weight loss on subsequent diabetes risk in overweight adults*. Journal of Epidemiology & Community Health, 2000.
  54(8): p. 596-602.
- 46. Lahmann, P., et al., Sociodemographic factors associated with long-term weight gain, current body fatness and central adiposity in Swedish women. International journal of obesity, 2000. 24(6): p. 685.
- Olson, M.B., et al., Weight cycling and high-density lipoprotein cholesterol in women: evidence of an adverse effect: a report from the NHLBI-sponsored WISE study. Journal of the American College of Cardiology, 2000. 36(5): p. 1565-1571.
- Morris, R.D. and A.A. Rimm, Long-term weight fluctuation and non-insulindependent diabetes mellitus in white women. Annals of epidemiology, 1992. 2(5): p. 657-664.

- 49. Blüher, M., *Obesity: global epidemiology and pathogenesis*. Nature Reviews Endocrinology, 2019: p. 1.
- Chooi, Y.C., C. Ding, and F. Magkos, *The epidemiology of obesity*. Metabolism, 2019. 92: p. 6-10.
- 51. Dietrich, A., et al., Body weight status, eating behavior, sensitivity to reward/punishment, and gender: relationships and interdependencies. Frontiers in psychology, 2014. 5: p. 1073.
- 52. Wise, J., Obesity rates rise substantially worldwide. Bmj, 2014. 348: p. g3582.
- 53. Sibai, A.M., et al., Nutrition transition and cardiovascular disease risk factors in Middle East and North Africa countries: reviewing the evidence. Annals of Nutrition and Metabolism, 2010. 57(3-4): p. 193-203.
- Burden of obesity in the Eastern Mediterranean Region: findings from the Global Burden of Disease 2015 study. International Journal of Public Health 2018 [cited 63; 165-176].
- 55. Mokdad, A.H., et al., Health in times of uncertainty in the eastern Mediterranean region, 1990–2013: a systematic analysis for the Global Burden of Disease Study 2013. The Lancet Global Health, 2016. 4(10): p. e704-e713.
- 56. Musaiger, A.O., Overweight and obesity in eastern mediterranean region: prevalence and possible causes. Journal of obesity, 2011. **2011**.
- Davis, E.M., et al., *Racial, ethnic, and socioeconomic differences in the incidence of obesity related to childbirth*. American Journal of Public Health, 2009. 99(2): p. 294-299.
- 58. Garawi, F., et al., *Differences between women and men in the prevalence of obesity across countries: is there an association with gender inequality?* European Journal of Clinical Nutrition, 2014. **1**: p. 5.
- Wells, J.C., et al., Associations of economic and gender inequality with global obesity prevalence: understanding the female excess. Social science & medicine, 2012. 75(3): p. 482-490.
- 60. World Health Organization. *Global Health Observatory (GHO) data*. 2020; Available from: <u>https://www.who.int/gho/ncd/risk\_factors/en/</u>.
- 61. Abdul-Rahim, H.F., et al., *Obesity and selected co-morbidities in an urban Palestinian population.* International Journal of obesity, 2001. **25**(11): p. 1736-1740.
- 62. Al-Rifai, A. and F. Roudi-Fahimi, A first glimpse at the 2004 Palestinian demographic and health survey. Population Reference Bureau, 2006.
- 63. Evaluation, I.f.H.M.a. *Global Burden of Disease* 2018; Available from: <u>http://www.healthdata.org/gbd</u>.
- 64. Palestinian Ministry of Health. *Health annual report*. 2018 [cited 2020 13-2]; Available from: <u>https://site.moh.ps/Content/Books/fE4zsafxsjNVhJntidJnqnnEHUibMuC1NYu66TN</u> <u>EmoNUJ1ZxeRcCm3\_Iei1j8d4YesYKxRyEhD6PZqdxzBa4z91pIhALGXoDGEhIE</u> <u>IPai9X90.pdf</u>.
- 65. Neumark-Sztainer, D., *Preventing obesity and eating disorders in adolescents: What can health care providers do?* Journal of Adolescent Health, 2009. **44**(3): p. 206-213.
- Dwyer, J.T. and J. Mayer, *Potential dieters: Who are they?* Journal of the American Dietetic Association, 1970. 56(6): p. 510.
- 67. Jeffery, R.W., et al., Prevalence of overweight and weight loss behavior in a metropolitan adult population: the Minnesota Heart Survey experience. American Journal of Public Health, 1984. 74(4): p. 349-352.

- Williamson, D.F., et al., Weight loss attempts in adults: goals, duration, and rate of weight loss. American journal of public health, 1992. 82(9): p. 1251-1257.
- 69. Serdula, M.K., et al., *Prevalence of attempting weight loss and strategies for controlling weight*. Jama, 1999. **282**(14): p. 1353-1358.
- Yaemsiri, S., M.M. Slining, and S.K. Agarwal, Perceived weight status, overweight diagnosis, and weight control among US adults: the NHANES 2003–2008 Study. International journal of obesity, 2011. 35(8): p. 1063.
- Katan, M.B., Weight-loss diets for the prevention and treatment of obesity. 2009, Mass Medical Soc.
- 72. Elran-Barak, R., et al., Overweight and obese midlife women in Israel: cultural differences in perceived weight status. International journal of public health, 2016.
  61(1): p. 39-47.
- 73. Mousa, T. and S.N. Beretvas, *Factor structure of scores of an Arabic version of the eating attitude test.* J Hum Nutr Food Sci, 2016. **4**(2): p. 1084.
- Shoraka, H., A. Amirkafi, and B. Garrusi, *Review of body image and some of contributing factors in Iranian population*. International journal of preventive medicine, 2019. 10.
- 75. da Silva Santos, J.F., et al., *Weight loss practices in Taekwondo athletes of different competitive levels*. Journal of exercise rehabilitation, 2016. **12**(3): p. 202.
- 76. Zhang, Y., et al., Long-term weight-change slope, weight fluctuation and risk of type
  2 diabetes mellitus in middle-aged Japanese men and women: findings of Aichi
  Workers' Cohort Study. Nutrition & diabetes, 2017. 7(3): p. e252.
- Foreyt, J.P., et al., *Psychological correlates of weight fluctuation*. International Journal of Eating Disorders, 1995. 17(3): p. 263-275.

- Field, A.E., et al., Weight cycling, weight gain, and risk of hypertension in women. American journal of epidemiology, 1999. 150(6): p. 573-579.
- 79. Kroke, A., et al., Recent weight changes and weight cycling as predictors of subsequent two year weight change in a middle-aged cohort. International journal of obesity, 2002. 26(3): p. 403.
- Tsai, C.-J., et al., Weight cycling and risk of gallstone disease in men. Archives of internal medicine, 2006. 166(21): p. 2369-2374.
- Davison, K., C. Markey, and L. Birch, *Etiology of body dissatisfaction and weight concerns among 5-year-old girls*. Appetite, 2000. 35(2): p. 143-151.
- 82. Smolak, L., Body image in children and adolescents: where do we go from here? Body image, 2004. 1(1): p. 15-28.
- 83. Anschutz, D.J., et al., Maternal behaviors and restrained eating and body dissatisfaction in young children. International Journal of Eating Disorders, 2009.
  42(1): p. 54-61.
- Banet- Weiser, S., *Girls rule!: Gender, feminism, and Nickelodeon*. Critical Studies in Media Communication, 2004. 21(2): p. 119-139.
- 85. Hayes, S. and S. Tantleff- Dunn, Am I too fat to be a princess? Examining the effects of popular children's media on young girls' body image. British Journal of Developmental Psychology, 2010. 28(2): p. 413-426.
- 86. Dittmar, H., E. Halliwell, and S. Ive, Does Barbie make girls want to be thin? The effect of experimental exposure to images of dolls on the body image of 5-to 8-year-old girls. Developmental psychology, 2006. 42(2): p. 283.
- Anschutz, D., et al., Watching your weight? The relations between watching soaps and music television and body dissatisfaction and restrained eating in young girls. Psychology and Health, 2009. 24(9): p. 1035-1050.

- Field, A.E., et al., *Relation between dieting and weight change among preadolescents and adolescents*. Pediatrics, 2003. 112(4): p. 900-906.
- Hagmar, M., et al., Special attention to the weight-control strategies employed by Olympic athletes striving for leanness is required. Clinical Journal of Sport Medicine, 2008. 18(1): p. 5-9.
- 90. Dosil, J., Eating disorders in athletes. 2008: John Wiley & Sons.
- 91. Werner, A., et al., *Weight-control behaviour and weight-concerns in young elite athletes–a systematic review*. Journal of eating disorders, 2013. **1**(1): p. 18.
- 92. Sundgot-Borgen, J., et al., *How to minimise the health risks to athletes who compete in weight-sensitive sports review and position statement on behalf of the Ad Hoc Research Working Group on Body Composition, Health and Performance, under the auspices of the IOC Medical Commission.* Br J Sports Med, 2013. **47**(16): p. 1012-1022.
- Kazemi, M., A. Rahman, and M. De Ciantis, Weight cycling in adolescent Taekwondo athletes. The Journal of the Canadian Chiropractic Association, 2011.
   55(4): p. 318.
- Saarni, S., et al., Weight cycling of athletes and subsequent weight gain in middleage. International journal of obesity, 2006. 30(11): p. 1639.
- 95. Slof-Op't Landt, M.C., et al., Prevalence of dieting and fear of weight gain across ages: a community sample from adolescents to the elderly. International journal of public health, 2017. 62(8): p. 911-919.
- 96. Marshall, C., C. Lengyel, and A. Utioh, *Body dissatisfaction: Among middle-aged and older women*. Canadian Journal of Dietetic Practice and Research, 2012. 73(2): p. e241-e241.

- Rodin, J., L. Silberstein, and R. Striegel-Moore. Women and weight: A normative discontent. in Nebraska symposium on motivation. 1984. University of Nebraska Press.
- Miller, S. and R.R. Wolfe, *The danger of weight loss in the elderly*. The Journal of Nutrition Health and Aging, 2008. 12(7): p. 487-491.
- 99. Mathus-Vliegen, E., Obesity Management Task Force of the European Association for the Study of Obesity. Prevalence, pathophysiology, health consequences and treatment options of obesity in the elderly: a guideline. Obes Facts, 2012. **5**(3): p. 460-483.
- 100. Neumark-Sztainer, D., et al., Accurate parental classification of overweight adolescents' weight status: does it matter? Pediatrics, 2008. **121**(6): p. e1495-e1502.
- 101. Neumark-Sztainer, D., et al., Family weight talk and dieting: how much do they matter for body dissatisfaction and disordered eating behaviors in adolescent girls? Journal of Adolescent Health, 2010. 47(3): p. 270-276.
- 102. Van Den Berg, P.A., et al., Maternal and adolescent report of mothers' weightrelated concerns and behaviors: Longitudinal associations with adolescent body dissatisfaction and weight control practices. Journal of pediatric psychology, 2010.
  35(10): p. 1093-1102.
- 103. Neumark-Sztainer, D., et al., Dieting and disordered eating behaviors from adolescence to young adulthood: findings from a 10-year longitudinal study. Journal of the American Dietetic Association, 2011. 111(7): p. 1004-1011.
- 104. Larson, N.I., D. Neumark-Sztainer, and M. Story, Weight control behaviors and dietary intake among adolescents and young adults: longitudinal findings from Project EAT. Journal of the American Dietetic Association, 2009. 109(11): p. 1869-1877.

- 105. Bartlett, S.J., T.A. Wadden, and R.A. Vogt, *Psychosocial consequences of weight cycling*. Journal of Consulting and Clinical Psychology, 1996. **64**(3): p. 587.
- 106. Schmitt, N., W. Nicholson, and J. Schmitt, *The association of pregnancy and the development of obesity-results of a systematic review and meta-analysis on the natural history of postpartum weight retention.* International Journal of Obesity, 2007. **31**(11): p. 1642.
- 107. Neighbors, L.A. and J. Sobal, *Prevalence and magnitude of body weight and shape dissatisfaction among university students*. Eating behaviors, 2007. **8**(4): p. 429-439.
- 108. Reba-Harrelson, L., et al., Patterns and prevalence of disordered eating and weight control behaviors in women ages 25–45. Eating and Weight Disorders-Studies on Anorexia, Bulimia and Obesity, 2009. 14(4): p. e190-e198.
- 109. Lin, L.F. and J.A. Kulik, *Social comparison and women's body satisfaction*. Basic and Applied Social Psychology, 2002. **24**(2): p. 115-123.
- 110. Williams, L., J. Germov, and A. Young, Preventing weight gain: a population cohort study of the nature and effectiveness of mid-age women's weight control practices. International Journal of Obesity, 2007. 31(6): p. 978.
- 111. Guh, D.P., et al., *The incidence of co-morbidities related to obesity and overweight: a systematic review and meta-analysis.* BMC public health, 2009. **9**(1): p. 88.
- 112. Ramage, S., et al., Healthy strategies for successful weight loss and weight maintenance: a systematic review. Applied Physiology, Nutrition, and Metabolism, 2013. **39**(1): p. 1-20.
- 113. Machado, E.C., M.F.d. Silveira, and V.M.F.d. Silveira, Prevalence of weight-loss strategies and use of substances for weight-loss among adults: a population study. Cadernos de saude publica, 2012. 28: p. 1439-1449.

- 114. Santos, I., A.M. Andrade, and P.J. Teixeira, Weight control attempts among Portuguese adults: prevalence, motives and behavioral strategies. Acta medica portuguesa, 2015. 28(1): p. 77-86.
- 115. Ismail, T.A.T., et al., Understanding Dieting and Previous Weight Loss Attempts among Overweight and Obese Participants: Insights into My Body Is Fit and Fabulous at Work Program. Korean journal of family medicine, 2018. **39**(1): p. 15.
- 116. Lemon, S.C., et al., Contributions of weight perceptions to weight loss attempts: differences by body mass index and gender. Body image, 2009. 6(2): p. 90-96.
- 117. Biener, L. and A. Heaton, *Women dieters of normal weight: their motives, goals, and risks*. American Journal of Public Health, 1995. **85**(5): p. 714-717.
- 118. Kayman, S., W. Bruvold, and J.S. Stern, *Maintenance and relapse after weight loss in women: behavioral aspects.* The American journal of clinical nutrition, 1990.
  52(5): p. 800-807.
- 119. Befort, C., et al., Weight maintenance, behaviors and barriers among previous participants of a university-based weight control program. International Journal of Obesity, 2008. 32(3): p. 519.
- 120. Ball, K., D. Crawford, and G. Mishra, Socio-economic inequalities in women's fruit and vegetable intakes: a multilevel study of individual, social and environmental mediators. Public health nutrition, 2006. 9(5): p. 623-630.
- 121. Roos, E., et al., *Trends of socioeconomic differences in daily vegetable consumption*, 1979–2002. European Journal of Clinical Nutrition, 2008. 62(7): p. 823.
- 122. Black, C., G. Moon, and J. Baird, *Dietary inequalities: what is the evidence for the effect of the neighbourhood food environment?* Health & place, 2014. **27**: p. 229-242.

- 123. Caspi, C.E., et al., *The local food environment and diet: a systematic review*. Health & place, 2012. 18(5): p. 1172-1187.
- 124. Rummo, P.E., et al., Neighborhood availability of convenience stores and diet quality: findings from 20 years of follow-up in the coronary artery risk development in young adults study. American journal of public health, 2015. **105**(5): p. e65-e73.
- 125. Umberson, D., Gender, marital status and the social control of health behavior.Social science & medicine, 1992. 34(8): p. 907-917.
- 126. Kahn, H.S. and D.F. Williamson, The contributions of income, education and changing marital status to weight change among US men. International Journal of Obesity, 1990. 14(12): p. 1057-1068.
- 127. Rissanen, A., et al., *Determinants of weight gain and overweight in adult Finns*. European journal of clinical nutrition, 1991. **45**(9): p. 419-430.
- 128. Averett, S.L., A. Sikora, and L.M. Argys, *For better or worse: relationship status and body mass index.* Economics & Human Biology, 2008. **6**(3): p. 330-349.
- 129. Umberson, D., et al., *Parenthood and trajectories of change in body weight over the life course*. Social science & medicine, 2011. **73**(9): p. 1323-1331.
- 130. Sarlio-Lähteenkorva, S., A. Rissanen, and J. Kaprio, A descriptive study of weight loss maintenance: 6 and 15 year follow-up of initially overweight adults. International journal of obesity, 2000. 24(1): p. 116.
- 131. Jeffery, R.W. and A.M. Rick, Cross-sectional and longitudinal associations between body mass index and marriage-related factors. Obesity Research, 2002.
  10(8): p. 809-815.
- 132. Von Ranson, K.M., W.G. Iacono, and M. McGue, Disordered eating and substance use in an epidemiological sample: I. Associations within individuals. International Journal of Eating Disorders, 2002. 31(4): p. 389-403.

- 133. Jeffery, R.W. and S.A. French, Socioeconomic status and weight control practices among 20-to 45-year-old women. American journal of public health, 1996. 86(7): p. 1005-1010.
- 134. Jarry, J.L., et al., Weight gain after smoking cessation in women: the impact of dieting status. International Journal of Eating Disorders, 1998. **24**(1): p. 53-64.
- 135. Boles, S.M. and P.B. Johnson, *Gender, weight concerns, and adolescent smoking*.Journal of addictive diseases, 2001. 20(2): p. 5-14.
- 136. Cavallo, D.A., et al., Gender and weight concerns in adolescent smokers. Addictive behaviors, 2006. 31(11): p. 2140-2146.
- 137. Klesges, R.C. and L.M. Klesges, *Cigarette smoking as a dieting strategy in a university population*. International Journal of Eating Disorders, 1988. 7(3): p. 413-419.
- 138. Saarni, S., Obesity, smoking and dieting. 2008.
- 139. Chiolero, A., et al., *Clustering of risk behaviors with cigarette consumption: a population-based survey*. Preventive medicine, 2006. **42**(5): p. 348-353.
- 140. French, S.A., D.J. Hennrikus, and R.W. Jeffery, *Smoking status, dietary intake, and physical activity in a sample of working adults*. Health Psychology, 1996. 15(6): p. 448.
- 141. Kaczynski, A.T., et al., *Smoking and physical activity: a systematic review*. American journal of health behavior, 2008. **32**(1): p. 93-110.
- 142. Subar, A.F., L.C. Harlan, and M.E. Mattson, Food and nutrient intake differences between smokers and non-smokers in the US. American journal of public health, 1990. 80(11): p. 1323-1329.
- 143. Tuschl, R.J., *From dietary restraint to binge eating: some theoretical considerations*. Appetite, 1990. **14**(2): p. 105-109.

- 144. Field, A., et al., Association of weight change, weight control practices, and weight cycling among women in the Nurses' Health Study II. International journal of obesity, 2004. 28(9): p. 1134.
- 145. Marchesini, G., et al., *Weight cycling in treatment-seeking obese persons: data from the QUOVADIS study.* International journal of obesity, 2004. **28**(11): p. 1456.
- 146. de Zwaan, M., S. Engeli, and A. Müller, *Temperamental factors in severe weight cycling*. A cross-sectional study. Appetite, 2015. **91**: p. 336-342.
- 147. APA, A.P.A., Diagnostic and statistical manual of mental disorders. DSM-IV, 1994.
- 148. Cash, T.F. and T. Pruzinsky, *Body image: A handbook of theory, research, and clinical practice*. 2004: Guilford Press.
- 149. Grogan, S., Body image: Understanding body dissatisfaction in men, women and children. 2016: Routledge.
- 150. Griffiths, S., et al., Sex differences in the relationships between body dissatisfaction, quality of life and psychological distress. Australian and New Zealand Journal of Public Health, 2016. 40(6): p. 518-522.
- 151. Malinauskas, B.M., et al., *Dieting practices, weight perceptions, and body composition: a comparison of normal weight, overweight, and obese college females.* Nutrition Journal, 2006. **5**(1): p. 11.
- 152. Yahia, N., et al., *Dieting practices and body image perception among Lebanese university students*. Asia Pacific Journal of Clinical Nutrition, 2011. **20**(1): p. 21.
- 153. Bayyari, W., L. Henry, and C. Jones, *Dieting behaviours, obesity and predictors of dieting among female college students at Palestinian universities.* 2013.
- 154. Putterman, E. and W. Linden, *Appearance versus health: Does the reason for dieting affect dieting behavior?* Journal of Behavioral Medicine, 2004. **27**(2): p. 185-204.

- 155. Barnes, A.S. and R.T. Kimbro, Descriptive study of educated African American women successful at weight-loss maintenance through lifestyle changes. Journal of general internal medicine, 2012. 27(10): p. 1272-1279.
- 156. Arora, T., et al., *The relationship between dieting and levels of perceived psychological stress in United Arab Emirates residents*. Arab Journal of Nutrition and Exercise (AJNE), 2017: p. 50-57.
- 157. Nam, G.E., et al., Impact of body mass index and body weight variabilities on mortality: a nationwide cohort study. International Journal of Obesity, 2019. 43(2):
  p. 412-423.
- 158. Lissner, L., et al., *Body weight variability in men: metabolic rate, health and longevity.* International journal of obesity, 1990. **14**(4): p. 373-383.
- 159. Folsom, A., et al., Weight variability and mortality: the Iowa Women's Health Study. International journal of obesity and related metabolic disorders: journal of the International Association for the Study of Obesity, 1996. 20(8): p. 704-709.
- 160. Stevens, V.L., et al., *Weight cycling and mortality in a large prospective US study*. American journal of epidemiology, 2012. **175**(8): p. 785-792.
- 161. Hamm, P., R.B. Shekelle, and J. Stamler, Large fluctuations in body weight during young adulthood and twenty-fwe-year risk of coronary death in men. American journal of epidemiology, 1989. 129(2): p. 312-318.
- 162. Lissner, L., et al., Variability of body weight and health outcomes in the Framingham population. New England Journal of Medicine, 1991. 324(26): p. 1839-1844.
- 163. Blair, S.N., et al., Body weight change, all-cause mortality, and cause-specific mortality in the Multiple Risk Factor Intervention Trial. Annals of internal medicine, 1993. 119(7\_Part\_2): p. 749-757.

- 164. Diaz, V.A., A.G. Mainous, and C.J. Everett, *The association between weight fluctuation and mortality: results from a population-based cohort study.* Journal of community health, 2005. **30**(3): p. 153-165.
- 165. Rzehak, P., et al., Weight change, weight cycling and mortality in the ERFORT Male Cohort Study. European journal of epidemiology, 2007. 22(10): p. 665-673.
- 166. Dyer, A.R., J. Stamler, and P. Greenland, Associations of weight change and weight variability with cardiovascular and all-cause mortality in the Chicago Western Electric Company Study. American journal of epidemiology, 2000. 152(4): p. 324-333.
- 167. Yatsuya, H., et al., Association between weight fluctuation and fasting insulin concentration in Japanese men. International journal of obesity, 2003. 27(4): p. 478-483.
- 168. Tamakoshi, K., et al., Long-term body weight variability is associated with elevated C-reactive protein independent of current body mass index among Japanese men. International journal of obesity, 2003. 27(9): p. 1059-1065.
- 169. Cologne, J., et al., Association of weight fluctuation with mortality in Japanese adults. JAMA network open, 2019. **2**(3): p. e190731-e190731.
- 170. Strychar, I., et al., Anthropometric, metabolic, psychosocial, and dietary characteristics of overweight/obese postmenopausal women with a history of weight cycling: a MONET (Montreal Ottawa New Emerging Team) study. Journal of the American Dietetic Association, 2009. **109**(4): p. 718-724.
- 171. Guagnano, M., et al., *Risk factors for hypertension in obese women. The role of weight cycling.* European Journal of Clinical Nutrition, 2000. **54**(4): p. 356.
- 172. Rodin, J., et al., *Weight cycling and fat distribution*. International journal of obesity, 1990. 14(4): p. 303-310.

- 173. Wallner, S., et al., *Body fat distribution of overweight females with a history of weight cycling*. International journal of obesity, 2004. **28**(9): p. 1143.
- 174. Cereda, E., et al., Weight cycling is associated with body weight excess and abdominal fat accumulation: a cross-sectional study. Clinical Nutrition, 2011. 30(6):
  p. 718-723.
- 175. Schulz, M., et al., Associations of short-term weight changes and weight cycling with incidence of essential hypertension in the EPIC-Potsdam Study. Journal of human hypertension, 2005. **19**(1): p. 61-67.
- 176. Grave, R.D., et al., *Binge eating disorder and weight cycling in obese women*. Eating Disorders, 1996. 4(1): p. 67-73.
- 177. Sherwood, N.E., R.W. Jeffery, and R. Wing, *Binge status as a predictor of weight loss treatment outcome*. International Journal of Obesity, 1999. **23**(5): p. 485-493.
- 178. Elfhag, K. and S. Rössner, Who succeeds in maintaining weight loss? A conceptual review of factors associated with weight loss maintenance and weight regain.
  Obesity reviews, 2005. 6(1): p. 67-85.
- 179. Chua, J.L., S. Touyz, and A. Hill, *Negative mood-induced overeating in obese binge eaters: an experimental study*. International Journal of Obesity, 2004. **28**(4): p. 606.
- 180. Stein, R.I., et al., What's driving the binge in binge eating disorder?: A prospective examination of precursors and consequences. International Journal of Eating Disorders, 2007. 40(3): p. 195-203.
- 181. Stojek, M.M., et al., Associations of adolescent emotional and loss of control eating with 1- year changes in disordered eating, weight, and adiposity. International Journal of Eating Disorders, 2017. 50(5): p. 551-560.

- 182. Palestinian Central Bureau of Statistics. Population, Housing and Establishments Census 2017. 2017; Available from: <u>http://www.wafainfo.ps/userfiles/server/pdf/General\_Population\_Statistics2017.pdf</u>.
- 183. Panarotto, D., et al., *Reliability and internal consistency of questionnaire for evaluating weight cycling in Southern Brazil.* Journal of clinical nursing, 2014. 23(3-4): p. 385-393.
- 184. Katsura, T. and A. Hoshino, Weight Cycling in Population-based Studies. Journal of the Japanese Association of Rural Medicine, 2004. 52(6): p. 979-991.
- 185. Gregory, C.O., et al., Perceived health risk of excess body weight among overweight and obese men and women: differences by sex. Preventive medicine, 2008. 47(1): p. 46-52.
- 186. Aoun, A., et al., *Validation of the Arabic version of the SCOFF questionnaire for the screening of eating disorders*. Eastern Mediterranean Health Journal, 2015. **21**(5).
- 187. Saleh, R.N., et al., Disordered eating attitudes in female students of An-Najah National University: a cross-sectional study. Journal of eating disorders, 2018. 6(1):
  p. 16.
- 188. Almadi, T., et al., *An Arabic version of the Perceived Stress Scale: Translation and validation study.* International Journal of Nursing Studies, 2012. **49**(1): p. 84-89.
- 189. Kira, I.A., et al., *Identity salience and its dynamics in Palestinians adolescents*.Psychology, 2011. 2(08): p. 781.
- 190. Kira, I.A., et al., *The dynamics of posttraumatic growth across different trauma types in a Palestinian sample.* Journal of Loss and Trauma, 2013. **18**(2): p. 120-139.
- 191. Buck, E., Critical Synthesis Package: Depression Anxiety Stress Scales (DASS).MedEdPORTAL, 2014. 10.

- 192. World Health Organization. *STEPwise approach to surveillance (STEPS)*. 2017; Available from: https://www.who.int/ncds/surveillance/steps/en/#.
- 193. Tremblay, L. and M. Limbos, Body image disturbance and psychopathology in children: research evidence and implications for prevention and treatment. Current Psychiatry Reviews, 2009. 5(1): p. 62-72.
- 194. Cheung, P.C., et al., A study on body weight perception and weight control behaviours among adolescents in Hong Kong. Hong Kong medical journal, 2007.
  13(1): p. 16.
- 195. Brener, N.D., et al., *The association between weight perception and BMI among high school students*. Obesity research, 2004. **12**(11): p. 1866-1874.
- 196. Hansel, B., et al., L'enquête Internet nationale «Dukan, et après?»: premiers résultats. Obésité, 2011. 6(3): p. 146-153.
- 197. Wang, Y., H. Liang, and X. Chen, *Measured body mass index, body weight perception, dissatisfaction and control practices in urban, low-income African American adolescents.* BMC public health, 2009. **9**(1): p. 183.
- 198. Ojala, K., et al., Attempts to lose weight among overweight and non-overweight adolescents: a cross-national survey. International Journal of Behavioral Nutrition and Physical Activity, 2007. **4**(1): p. 50.
- 199. Neumark-Sztainer, D., et al., Weight control practices and disordered eating behaviors among adolescent females and males with type 1 diabetes: associations with sociodemographics, weight concerns, familial factors, and metabolic outcomes. Diabetes care, 2002. 25(8): p. 1289-1296.
- 200. Mostafavi-Darani, F., S.-S. Daniali, and L. Azadbakht, *Relationship of body satisfaction, with nutrition and weight control behaviors in women.* International journal of preventive medicine, 2013. **4**(4): p. 467.

- 201. Al-Hindi, A.I., et al., Weight Reduction Perception and Practice among Female Students in Al-Azhar University-Gaza, Palestine. Weight Reduction Perception and Practice among Female Students in Al-Azhar University-Gaza, Palestine, 2009. 6(2).
- 202. Kahn, H.S., D.F. Williamson, and J.A. Stevens, *Race and weight change in US women: the roles of socioeconomic and marital status*. American journal of public health, 1991. 81(3): p. 319-323.
- 203. Kahn, H.S. and D.F. Williamson, *Is race associated with weight change in US adults after adjustment for income, education, and marital factors?* The American journal of clinical nutrition, 1991. **53**(6): p. 1566S-1570S.
- 204. Musaiger, A.O., N.E. Shahbeek, and M. Al-Mannai, *The role of social factors and weight status in ideal body-shape preferences as perceived by Arab women.* Journal of biosocial science, 2004. **36**(6): p. 699-707.
- 205. Starling, A.P., et al., Associations of maternal BMI and gestational weight gain with neonatal adiposity in the Healthy Start study. The American journal of clinical nutrition, 2015. **101**(2): p. 302-309.
- 206. Rössner, S. and A. Öhlin, Pregnancy as a risk factor for obesity: lessons from the Stockholm Pregnancy and Weight Development Study. Obesity research, 1995.
  3(S2): p. 267s-275s.
- 207. Ziaei, R., et al., *The prevalence, attitudes, and correlates of waterpipe smoking among high school students in Iran: a cross-sectional study.* International journal of behavioral medicine, 2016. **23**(6): p. 686-696.
- 208. Meltzer, A.A. and J.E. Everhart, *Correlations with self- reported weight loss in overweight US adults*. Obesity research, 1996. **4**(5): p. 479-486.

- 209. Kahn, H.S., et al., Stable behaviors associated with adults' 10-year change in body mass index and likelihood of gain at the waist. American journal of public health, 1997. 87(5): p. 747-754.
- 210. Hofstetter, A., et al., *Increased 24-hour energy expenditure in cigarette smokers*.New England Journal of Medicine, 1986. **314**(2): p. 79-82.
- 211. Wing, R.R., Weight cycling in humans: a review of the literature. Annals of Behavioral Medicine, 1992. 14(2): p. 113-119.
- 212. Saarni, S., et al., Weight cycling of athletes and subsequent weight gain in middleage. International journal of obesity, 2006. **30**(11): p. 1639-1644.
- 213. Kroke, A., et al., Recent weight changes and weight cycling as predictors of subsequent two year weight change in a middle-aged cohort. International journal of obesity, 2002. 26(3): p. 403-409.
- 214. Giusti, V., et al., Predictive factors of binge eating disorder in women searching to lose weight. Eating and Weight Disorders-Studies on Anorexia, Bulimia and Obesity, 2004. 9(1): p. 44-49.
- 215. Elder, K.A., et al., Loss of control over eating is associated with eating disorder psychopathology in a community sample of Latinas. Eating behaviors, 2008. 9(4): p. 501-503.
- 216. Borges, M.B.F., et al., Binge- eating disorder in Brazilian women on a weight- loss program. Obesity Research, 2002. 10(11): p. 1127-1134.
- 217. Ledoux, M., et al., Correlation between cardiovascular disease risk factors and simple anthropometric measures. Canadian Heart Health Surveys Research Group.
  CMAJ: Canadian Medical Association journal= journal de l'Association medicale canadienne, 1997. 157: p. S46-53.

- 218. Venditti, E.M., et al., *Weight cycling, psychological health, and binge eating in obese women.* Journal of Consulting and Clinical Psychology, 1996. **64**(2): p. 400.
- 219. Health, N.C.C.f.M., *Eating disorders: Core interventions in the treatment and management of anorexia nervosa, bulimia nervosa and related eating disorders.* 2004: British Psychological Society (UK).
- 220. Paxton, S.J., et al., Body image satisfaction, dieting beliefs, and weight loss behaviors in adolescent girls and boys. Journal of youth and adolescence, 1991.
  20(3): p. 361-379.
- 221. Stice, E., *Risk and maintenance factors for eating pathology: a meta-analytic review*.Psychological bulletin, 2002. **128**(5): p. 825.
- 222. Leske, S., E. Strodl, and X.-Y. Hou, A qualitative study of the determinants of dieting and non-dieting approaches in overweight/obese Australian adults. BMC Public Health, 2012. 12(1): p. 1086.

## Annexes

Annex 1: Weight cycling and the associated factors questionnaire.

استبيان بحثى خاص بالسيدات فى محافظة رام الله

اسم الدراسة: انتشار ظاهرة التغير /التذبذب في الوزن عند السيدات في محافظة رام الله والأسباب المتعلقة بها

القسم الأول: المعلومات العامة رقم الاستمارة:\_\_\_\_ **]** تاريخ اليوم : \_\_\_/\_\_ / \_\_\_ / العمر بالسنوات : مكان السكن : 1. مدينة 2. قرية 3. مخيم الحالة الاجتماعية: 1. عزباء 2. متزوجة 3. عقد قران (مخطوبة) 4. منفصلة 5. مطلقة 6 أر ملة اذا كانت الاجابة متزوجة, ما هي عدد مرات الحمل التي انتهت بولادة /عدد الأولاد( ) المستوى التعليمي: أمي 2. ملم (يقرا ويكتب) 3. ابتدائي 4. اعدادي 5. ثانوي 6. دبلوم متوسط 07.بكالوريوس(جامعة) 08.دبلوم عالي 09.ماجستير 10. دكتوراه 98. أعرف العلاقة بقوة العمل خلال الاسبوع الماضي: 2. عامل من 15-34 ساعة 1 عامل من 1-14 ساعة 4 عامل 46 ساعة فأكثر 3. عامل من 35-45 ساعة 5. (لا يعمل ويريد العمل-سبق له العمل) بحث عن عمل خلال أربع أسابيع الماضية 6. (لا يعمل ويريد العمل-لم يسبق له العمل)بحث عن عمل خلال أربع أسابيع الماضية 7 التفرغ للدر اسة/التدريب (لا يعمل ولا يريد العمل) 8 التفرغ لأعمال المنزل 9 العجز /كبر السن/المرض 10 وجود اير اد 11 تقاعد 12 أخرى حدد

اذا كنت تعملين ما هو طبيعة عملك(اذا كانت الإجابة 1،2،3،4):

متوسط الدخل: 2. من 2000-أقل من 3500 شيكل 1. اقل من 2000 شيكل 4.أكثر من 5000 شيكل 3. من 3500-5000 شيكل 5. لا أعرف هل تعانى من أي مشاكل صحية? 1. نعم 2.لا (اذا كانت الاجابة نعم، ما هي ؟ هل أنت مدخنة (سجائر / ارجيلة / سيجارة الكترونية) 2 نعم بصورة غير منتظمة נعم بانتظام لا لا أدخن ولم يسبق لي التدخين 3. مدخنة سابقة هل تأتيك الدورة الشهرية: 2. نعم لكن غير منتظمة . ا.نعم دورة منتظمة بشكل طبيعي تأتى الدورة بمساعدة العلاج الهرموني. 4. لا اذا كانت الاجابة لا، كم كان عمرك عندما انقطعت الدورة الشهرية عنك؟ القسم الثاني. تقييم التذبذب في الوزن: 2. لا أعرف ما هو وزنك الحالى ؟ 1. كيف كان وزنك في السنتين السابقتين: حدث نقصان في هذه الفترة بقى ثابتا /مستقرا طوال هذه الفترة 4 تذبذب بين نقص وزيادة طوال هذه الفترة ازداد الوزن في هذه الفترة فى السنتين الماضيتين. هل حدث نقص متعمد (قمت بأي اجراء بقرار شخصى منك )لخسارة الوزن ؟ 2.لا 1. نعم اذا كانت الاجابة نعم ، هل خسرت في السنتين الماضيتين 5 كيلو غرام من وزنك فأكثر؟ 2.لا 1. نعم اذا كانت الاجابة نعم أجب، هل استرجعتي في السنتين الماضيتين هذه ال 5 كغم أو أكثر؟ 2.لا 1. نعم

نوع الحمية المستخدمة في هذه المرة	السبب الذي دفعك لخسارة الوزن في هذه المرة	رقم المحاولة لخسارة الوزن

اذا كانت الاجابة نعم ( خسرت 5 كغم أو أكثر ثم استرجعتي 5 كغم أو أكثر ، الرجاء تعبئة الجدول التالي :

القسم الثالث: اضطر ابات الطعام

هذا القسم سنطرح عليك 5 اسئلة مأخوذة من استبيان عالمي خاص باضطر ابات الطعام نملك الاذن بتعريبه و استخدامه في البحث, يرجى الإجابة على الاسئلة التالية ب نعم/لا :

لا	نعم	السؤال / الاجابة	
		هل تتعمدين التقيؤ لأنك تشعرين بتخمة مزعجة ؟	
		هل تقلقين من فقدان السيطرة على كمية الطعام التي تتناولينها؟	
		هل فقدت مؤخراً اكثر من 6.35 كغم خلال فترة تمتد على 3 أشهر؟	
		هل تعتقدين أنك سمينة بينما يقول الاخرون انك نحيفة جداً؟	
		هل يمكنك القول ان الطعام يسيطر على حياتك؟	

القسم الرابع: مستوى الضغط النفسي

الأسئلة التالية تستفسر عن مشاعرك و أفكارك خلال الشهر الماضي.

نرجو منك الاجابة على جميع الأسئلة ..

الحالة	اطلاقاً	نادرا	أحيا	كثيراً	دائما (في أغلب
	(أبدأ)		Ľ		الأحيان
<ol> <li>ذلال الشهر الماضي، الى أي مدى</li> </ol>					
أحسست بالانزعاج بسبب حدوث أمر غير					
متوقع ؟					
<ol> <li>ذلال الشهر الماضي، الى أي مدى</li> </ol>					
أحسست بعدم القدرة على التحكم في الأمور					
الهامة بحياتك ؟					
<ol> <li>خلال الشهر الماضى، الى أي مدى</li> </ol>					
أحسست بالتوتر و الضّغط النّفسي ؟					
<ol> <li>4. خلال الشهر الماضي، الى أي مدى</li> </ol>	4	3	2	1	0
أحسست بالثقة في قدرتك على التعامل مع					
مشاكلك الخاصة ؟					
<ol> <li>خلال الشهر الماضي، الى أي مدى</li> </ol>	4	3	2	1	0
أحسست أن الأمور تسيّر كماً تريد ؟					
6.خلال الشهر الماضي، الى أي مدى وجدت					
نفسك غير قادر على التأقلم مع كل الأمور					
الواجب عليك القيام بها					
7.خلال الشهر الماضي، إلى أي مدى تمكنت	4	3	2	1	0
من التحكم في الأمور آلتي تَزعَجك					
8.خلال الشهر الماضي، آلى أي مدى أحسست	4	3	2	1	0
بأنك تملك زمام الأمور ( مسيطر على كافة					
أمورك) ؟					
9.خلال الشهر الماضي، الى أي مدى أحسست					
بالغضب بسبب أمور خَارجةً عَن تحكمك					
10. خلال الشبهر الماضي، إلى أي مدى					
أحسست بأن الصعاب تتراكم عليك لدرجة أنك					
لم تعد تستطيع التغلب عليها ؟					

**هل تشعرين بالرضا تجاه مظهر جسمك؟** نعم لا احيانا

القياسات: الوزن(كغم):\_\_\_\_ الطول(سم):.\_\_ . \_\_\_ محيط الخصر:\_\_.\_\_

محيط الارداف: \_\_\_\_ \_\_

### **Annex 2: The consent form**

عنوان الدراسة : اسم الدراسة: انتشار ظاهرة التغير /التذبذب في الوزن عند السيدات في محافظة رام الله والأسباب المتعلقة بها

اسم الباحث الرئيسي: آثار بواطنة

الباحث المشرف: الدكتورة نيفين أبو ارميلة

عزيزتي المشتركة: إذا كنت لا تعاني من الأمراض التالية ( السكري: التراكمي اكثر من 10%, فرط نشاط الغدة الدرقية : أكثر من 10 او كسل الغدة الدرقية : أقل من 2, أو مشخصة بمرض السرطان , أو حدث اجهاض في السنتين الاخيرتين, أو تتناولي أي أنواع من الأدوية التي تقلل الدهون في الدم ,واذا لم يكن لديك أي مشكلة لتحديد عمرك, فالرجاء قراءة ما يلي:

هذا الاستبيان يهدف الى معرفة مدى انتشار ظاهرة (التذبذب في الوزن) والعوامل المساهمة في ذلك عند السيدات في محافظة رام الله والبيرة وهو ضمن مشروع بحثي لرسالة الماجستير للطالبة آثار بواطنة في جامعة بير زيت.

يحتوي الاستبيان على عدة أجزاء, يرجى من حضرتك التعاون بالاجابة على الأسئلة بمصداقية تامة,مع العلم أن المعلومات الخاصة بك والقياسات ( الوزن زالطول ومحيط الخصر والأرداف) سنحافظ على سريتها وعدم اطلاع من لايعنيه الأمر عليها, ولن تكون الا لأغراض البحث العلمي واطلاع القائمين على البحث عليها, مدة تعبئة الاستمارة ما يقارب 20 دقيقة. اذا كنت ترغبين في المشاركة ,الرجاء التوقيع في المكان المخصص أدناه..

توقيع الباحث

# Annex 3: University ethical clearance to start field work

معهد الصحية العامية والمجتمعية Institute of Community and Public Health



#### Institute of Community and Public Health - Birzeit University

#### Ethics Review Committee (ERC)

Part I: To be completed by the applicant:

Date of application: July 25, 2019 Applicant's name: Athar Bawatna Institution: Institute of Community and Public Health / Birzeit University

Reference No:	2019 (7 - 1)
Project Title:	Prevalence of weight cycling and its associated factors among women in Ramallah governorate
Names of contributing researchers, other than the Principal Investigator/ Applicant:	Dr. Niveen Abu-Rmeileh - Supervisor

Comments: (if any)

#### Part II: To be completed by the (ERC)

\*Decision:

The ICPH-BZU Research Ethics Review Committee approves this study.

#### Decision date: August 17, 2019

Ethics Review Committee members, qualifications and signatures:

Name	Specialty	Qualifications	Signature
Maysaa Nemer	Occupational Epidemiology	PhD	Martin
Rula Ghandour	Epidemiology	МРН	Rula Ghandow
Aisha Shalash	Public Health	МРН	AQ
		-	11 20



## Annex 4:

a- Bivariate analysis between marital status as the dependent variable and BMI as an independent variable.

Marital status	Normal weight	Overweight	Obese	Test statistic	
Maritar status	%	%	%	χ²	P- value
Married	70.8	85.8	82.3	0.720	0.008
Non-married	29.2	14.2	17.7	9.729	

b- Bivariate analysis between smoker as a dependent variable and BMI as an independent variable

Smoking	Normal weight	Overweight	Obese	Test statistic	
Smoking	%	%	%	χ²	P- value
Smoker	63.1	54.0	84.1	25 196	0.000
Non-smoker	36.9	46.0	15.9	23.180	0.000

c- Bivariate analysis between body image satisfaction as a dependent variable and possibility of eating disorders as an independent variable

Possibility of eating	Satisfied with body image	Sometimes satisfied with body image	Dissatisfied with body image	Test sta	atistics
uisoruers	%	%	%	χ²	P- value
Yes	31.2	59.3	68.0	24 420	0.000
No	68.8	40.7	32.0	34.420	