

Proposal of final project for M.P.H.

**Self-Perception of Excess Body Weight and the Knowledge of Its
Consequences for Health in Adult Females in Karaj, Iran**

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Abstract

BACKGROUND: Recent research and studies have shown being overweight and obese, which both are prevalent among Iranian population, are associated with increased morbidity and mortality. Previous literature showed misperception of body weight also is prevalent among overweight/obese people.

PURPOSE OF STUDY: to explore the self-perception of body weight and of the consequences of excess weight for health and their intention to reduce weight, among overweight/obese non-pregnant women over 18 in Karaj, Iran, before and after an intervention which is introducing an accurate assessment of body weight [according to classes of Body Mass Index (BMI)] and sharing new data that even being overweight is associated with increased morbidities and mortality.

METHODOLOGY: Thirty-four adult women aged over 18 who were overweight or obese were interviewed through convenience sampling. Self-reported height and weight were collected and self-perception of body weight category and participants' intention to follow a program to reduce weight were asked. During the interview, height and weight were measured by interviewer, Body Mass Index was introduced and a presentation about association of being overweight/obese and increased risk of mortality and morbidity was presented. To verify if sharing information about the consequences of being overweight/obese can change participant's mind about the perceived association of being overweight/obese and increased risk of diseases, and also their self-perceived risk of developing diseases before and after sharing information, Wilcoxon matched-pair test was used, at the significance level of 0.05. To assess the differences between self-reported and

measured height and weight, the level of agreement for quantitative continuous variables, Bland Altman approach is used in CRAN. The kappa statistic was used to determine the level of agreement between the measured and estimated BMI from self-reported height and weight expressed as the categories: normal, overweight and obese. Clopper-Pearson Exact method was used to calculate confidence intervals (CI) of proportions for number of people who had more motivation to follow a program to reduce weight.

FINDINGS: According to the findings, the level of agreement between self-perceived body weight category and actual body weight category was moderate: 0.54 ($p < 0.001$). In addition, the perception of association of developing type 2 diabetes mellitus, cardiovascular diseases, cancer, asthma, gall bladder diseases and osteoarthritis, and being overweight and obesity after the intervention was increased but not for chronic back pain. Self-perceived risk of developing diabetes, cancer and asthma were also raised. Informing about these information by personal physician or professional can be more effective as mentioned by 3 of participants. In addition, the motivation for following a program to reduce weight was increased in both, people who was challenging to do something for it at the time of interview (0.81-1.00, 95%CI) and people who didn't do it (0.57-0.98, 95%CI). Some of the motivators mentioned by interviewees to reduce weight were for being healthy, better appearance and be fitted for more desirable clothes, comfort in movement and relieve current pains. On the other hand, affected by stress of being on a diet, unsuccessful attempts, lack of time, being concerned by consequences of strict diets were some of obstacles raised by participants. Only 1 of participants tended to go to nutritional experts to control their weight due to lack of trust.

CONCLUSION: Overall, Comparing the level of agreement for estimated BMI from reported height and weight with actual BMI and the level of agreement for participants' perceived weight status with their actual weight status suggested that the misperception of weight category could be improved if the participants calculate their BMI.

Being informed about the consequences of being overweight or obese have the potential to help this group of people to consider increased risk regarding to their weight and motivate them to follow a program to reduce weight. Giving these information by personal physician or professional can be more effective. Lack of trust to nutritionists can be one of main reasons that prevent these overweight/obese women to benefit from a professional and appropriate diet to reduce weight.

LIMITATIONS: Having no follow-up interviews deprived us to see how much of information would be remembered after some weeks or months and how serious interviewees would follow a program to reduce weight. Moreover, we can't evaluate the probable weight loss in them.

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Introduction

Noncommunicable diseases are the cause of 82% of total death in all ages in 2018, in Iran, while cardiovascular diseases are responsible for 43%, Cancer for 16% and diabetes for 4% of these cases (WHO, 2018). Being overweight and obesity are risk factors which are associated with diabetes, cardiovascular diseases except heart failure in addition to nearly all cancers, asthma, gall bladder disease, osteoarthritis and chronic back pain (Guh et al., 2009). More recently it has been shown in four continents that even being overweight is associated with increased mortality risk (Global BMI Mortality Collaboration, 2016). Consequently, being overweight or obesity among Iranian population is a major concern. It is estimated that 63.1% and 30.6% of women and 58.0% and 19.3% of men in Iran are overweight and obese respectively (WHO, 2016). Despite of the effectiveness of behavioral strategies and interventions, they are not widely or effectively used by overweight population due to lack of some psychological mechanisms including autonomous motivation, self-efficacy, self-regulation skills, positive body image, and flexible eating restraint (Pedro J Teixeira, 2015). So a wide range of internal, external and situational barriers are observed which stop overweight people from taking an effective action (Sharifi et al., 2013). It is presumed that a correct self-perception of being overweight and obese can be a prerequisite to seek an intervention to lose weight, but there is evidence from different studies around the world including Iran (Dorosty et al., 2014) that people have misperception about their body weight. In addition, the people who perceive themselves overweight can have a more risk of overeating and subsequent weight gain in response to stress (Rabinson, 2015). It seems unreasonable focus on weight rather than health not only lead to stress, but can also lead to body dissatisfaction and eating disorders. (Salas, 2015).

This study explores the self-perception of body weight and risk of consequences from excess weight for health among overweight/obese female adults and evaluates whether introducing BMI measurement and morbidity and mortality data may change their perception of their body weight and of the associated risk of developing associated diseases and its consequences in terms of morbidities and mortality. It is generally believed that the prime motivating factor for women to lose weight is to improve their appearance. While this may be true we hypothesized that if the participants can recognize the actual risk of developing diseases because of the excess weight they have, they may be more motivated to lose weight.

Research question

Does an accurate assessment of body weight (BMI) and sharing new information that even being overweight is associated with increased morbidities and mortality, change the intention of affected women to commit themselves to a weight loss program?

Objectives

General Objective

To explore the self-perception of body weight and of the consequences of excess weight for health among overweight/obese non-pregnant women over 18 in Karaj, Iran, before and after introducing an accurate assessment of body weight and sharing new data that even being overweight is associated with increased morbidities and mortality.

Specific Objectives

- To identify the self-perception of participant about their body weight category.

- To identify the perception of participant about the association between overweight/obesity with different diseases.
- To determine the perception of participants about the risk that they may develop each of diseases.
- To evaluate the intention of participant for seeking a program to reduce their weight.
- To measure the body mass index (BMI) and determine the self-perception of participant about their body weight is altered when they are informed of their BMI.
- To identify the reasons why participants who do not accept their weight status.
- To determine the perception of participants about the association of diseases between overweight and obese with different diseases after sharing the morbidity and mortality data associated with being overweight/obesity.
- To identify any change in perception of participants about the risk of developing the diseases after sharing the morbidity and mortality data.
- To identify any change in intention of participant for committing themselves to a program to reduce weight after sharing the morbidity and mortality data.
- To identify the factors that impede or motivate participants to follow a weight loss program.

Literature Review

In this section I shall review the literature on self-perception of body weight. While the review is not necessarily exhaustive, I wish to draw attention to the fact that misperception of body weight has been observed to varying degrees in many countries and cultures around the world. I will then explore factors that have been identified to impair the ability of losing and maintaining excess body weight. I shall demonstrate that motivation is a key component to assist in overcoming these problems. Therefore, strategies to improve motivation are likely to impact many of the barriers to weight loss and maintenance.

Previous studies have indicated that misperception about body weight is very prevalent among different populations. Among them a study (Moore et al., 2010) on 323 African American women who were recruited from urban health centers in Atlanta, showed 44% of overweight people and 72% of the obese women have perceived themselves being normal weight and overweight respectively. Although normal, overweight and obese participants in each group evaluated the seriousness of associated diseases including high blood pressure, type 2 diabetes, high cholesterol and cardiovascular diseases “very serious” (the mean response 3.92 to 4.47 out of 5 in each group), overweight women perceived the self-risk of developing diseases for themselves similar to normal weight participants with relatively low risk for developing the diseases, even overweight women without any misperception about their weight (2.2 to 2.7). However obese people believed they had higher risk of developing associated diseases (mean ranged from 3.17 to 3.51, $p < .02$ for all diseases).

Other studies also have shown this underestimation of body weight among overweight/obese people among different ethnicities and races including one study (Easton et al. 2017) on 17009 Mexican adults out of 20360 people aged 20 or above, with BMI ranged

from 13 to 60 kgm², consisted of 63.5% women and 36.5% men, who had participated in Mexican National Health and Nutrition Survey (ENSANUT) 2006. The results showed overweight and obese people regardless of their gender underestimated their weight and this misperception existed even among people who evaluated previously by a medical professional.

In another study (Bennett et al., 2006), Whites, Hispanics and Blacks were compared. The data collected from nationally-representative data from the National Health and Nutrition Examination Survey since 1999 to 2002, including overweight and obese adults comprised 3115 men and 3437 women. The recognition of weight status as “about the right weight/underweight” were classified as weight misperception. The results indicated overweight Black women with 40.9% prevalence of misperception and overweight Black men with 66.4% were among the groups with the highest prevalence of misperception, and obese White women and men had the lowest prevalence of misperception with 3.9% and 8.9%, respectively. By comparison with white people, blacks (OR=2.06, 95% CI: 1.71, 2.54) were twice as likely and Hispanics (OR=1.70, 95%CI: 1.33, 2.17) were 70 percent more likely than Whites to misperceive their weight while adjusted for demographic differences.

A cross-sectional survey in Northeast China was carried out and complex sampling was used to recruit 20552 adults aged 18-79. The outcome indicated that more than 42% of overweight people underestimated their body weight as either “normal weight” or “very thin” and among obese people less than 30% were aware of their weight. The result showed the prevalence of misperception was higher in rural areas, increased with age and decreased by higher education level (Gao et al., 2017).

The underestimation of body weight also have seen in more studies, including one study (Johnson et al. 2017) that analyzed the weight perception data collected from population based surveys in 2007 and 2012 in Great Britain on 657 obese adults. In women accurate self-perception of body weight was 13% in 2007 and 11% in 2012, while this proportion was even lower among men with 4% in 2007 and 7% in 2012.

In the Netherlands, a cross-sectional study in a population-based sample consisted of 1295 men and women who aged 60-96 years was conducted. 19.9% of men and 29.3% of women were obese but only 4.4% of obese men and 12.3% of obese women had an accurate self-perception of their weight status (Monteagudo et al., 2015). Such underestimation of self-perception were also seen in one study carried out in USA on overweight and obese people (Mueller et al., 2014).

In 2010, a cross-sectional study (Dorosty et al., 2014) in Iran at urban health centers located in Tehran was done. 542 women who work at health centers were recruited with a single stage stratified cluster-sampling method. The results showed 15.3% of overweight women perceived their weight status as normal and 84.7% used the terms of either overweight or obese. This misperception was lower among obese women: 1.2% but in 81% of perceived normal and overweight/obese weight status respectively.

On the other hand, comparing two genders, some of these studies have shown women had more accurate self-perception of body weight (Mueller, 2014; Bennett, 2006) while others showed less accuracy in women's perception (Johnson, 2017).

Since these misperceptions of body weight status were identified by comparing the perception of participants with their BMI and BMI is directly affected by height and weight,

the perceived and self-reported height and weight of participants were examined in following studies.

In 2009 in Rochester, Minnesota at the Mayo Clinic a total of 508 consecutive adult general internal medicine outpatients including 257 females and 251 males who aged 62.9 ± 14 years were asked to complete a questionnaire about their heights, weights and self-perceived BMI categories. The results showed the average of self-reported height was more than the average of measured height (170.2 ± 10.4 cm vs 169.4 ± 10.1 cm; $p < .001$) and when comparing weights, the average of self-reported weight was lower than the average of measured weight (80.3 ± 20.1 kg vs 81.9 ± 21.1 kg; $p < .001$). Consequently, the average of self-reported BMI was also lower than the average of measured BMI (27.6 ± 5.7 kg/m² vs 28.3 ± 6.1 kg/m²; $p < .001$) (Mueller et al., 2014).

In a cross-sectional survey in the community of Vara in Sweden which included 1703 individuals consisted of 860 men and 843 women who aged 30 to 75 years, the validity of self-reported information of height and weight was evaluated. When self-reported heights and weights were compared with measured information, the mean differences showed underestimation of weight by both men (1.6 kg; 95% CI: 1.4 to 1.8) and women (1.8 kg; 95% CI: 1.6 to 2.0). In addition, the mean discrepancy showed overestimation of heights in men (-0.3 cm; -0.5 to -0.2) and also in women (-0.4 cm; -0.5 to -0.2) (Nyholm, 2007).

Misperception of body weight status especially underestimation of it by overweight/obese people can be an obstacle not to be motivated to follow a program to reduce weight. Nevertheless, there are other factors that hamper reducing weight for overweight/obese people.

A conceptual review (Elfhag, 2004) had addressed comprehensively the factors that are associated with weight regain and weight loss maintenance through reviewing 57 studies which had evaluated the indicators, including critical individual characteristics. They yielded varied factors, while some had an important role as risk factors which hamper losing and maintaining weight, some other can facilitate these processes.

The results of the review (Elfhag, 2004) suggested that a realistic self-determined weight to achieve is important for people to maintain the weight loss because failure in achieving it can discourage people and destroy their belief about their ability to control weight. As a result, it leads to abandonment of activities which had helped them to reduce weight. In an observational study (Grave, 2005) 1785 obese women who had sought treatment from 23 Italian medical centers were examined to see how the weight loss expectations at baseline can influence attrition. After one year, 51.7% of patients dropped out the treatment. Logistic regression analysis demonstrated a higher weight loss expectation for one year is associated with attrition at 12 months with a hazard ratio equals to 1.12, 95% confidence interval 1.04- 1.20; $p=0.0018$. So initial weight loss expectation can play an important role as an independent cognitive factor in obese people to abandon the treatment. So it is recommended by medical experts and governmental guidelines that obese people should be encouraged to seek modest weight loss instead of struggling for an ideal and unreasonable weight (Foster, 1997).

Physical activity with ability to direct energy expenditure and on the other hand by improving physical fitness which can cause an increase in the amount and intensity of daily activities helps weight maintenance. Lower total caloric intake, less dietary fat, reduced portion sizes, and reduced frequency of snacks, also by cutting down on foods like French

fries, dairy products, sweets and meat and cheese, butter, high-fat snacks, fried foods and desserts are associated with weight loss maintenance (Elfhag, 2004). Physical activity requires strong motivation in sedentary individuals.

The initial weight loss can also be a predictor for future outcome and compliance with treatment, the greater initial weight loss the better outcome (Elfhag, 2004). This finding has been confirmed in other study that was not included in Elfhag's review (Wadden, 1999).

In addition, eating behaviors (Elfhag, 2004) measured by Three Factor Eating Questionnaire (TFEQ), consisted of eating restraint, disinhibition and hunger were considered. Restraint which means "trying to resist from eating by conscious determination in order to control body weight" is a helping factor in "behavior modification treatments". On the other hand disinhibition which means the loss of control over eating also was associated with regaining weight. Finally, higher hunger measured by TFEQ at discharge has been negatively related to over-consumption.

Same results were seen in one randomized controlled weight management intervention study (Teixeira, 2009) with 225 overweight and obese women, designed to promote autonomous self-regulation of body weight randomly assigned women in each of a 1-year intervention group and control group. The result showed weight change in both groups, -7.3±5.9% and -5.5±5.0% after 12 and 24 months in intervention group versus -1.7±5.0% and -2.2±7.5% in control group. Change in psychosocial mediators were related with weight change including flexible cognitive restraint ($p<0.01$), disinhibition ($p<0.05$), exercise self-efficacy ($p<0.001$), exercise intrinsic motivation ($p<0.01$) and body dissatisfaction ($p<0.05$). In particular flexible restraint and exercise self-efficacy with effect ratio of 0.89 were associated with 24-month weight loss.

Control over eating behaviors is another factor. It is shown that more flexible control over eating behaviors is related to weight maintenance compared to rigid control, because in some cases restraint can be followed with feeling of being deprived and periods of overeating (Elfhag, 2004).

Binge eating or binge eating disorder (Elfhag, 2004) is the consumption of large quantities of food without being in control of this behavior, and the distress associated with the binge eating. It is shown that more binge episodes is associated with more weight regain. One study (Yanovski, 1994) has addressed the possible effects of binge eating disorder (BED) on weight loss and maintenance. To determine the potential effects they recruited 38 overweight/obese women aged 18 to 49 for a 26-week weight loss treatment. Diagnosed by, 21 participants with the DSM-IV criteria for binge eating disorder and 17 with little or no binge eating disorder were included in the study. The participants were blinded from the hypothesis and reasons for allocation in each group. The analysis showed participants with BED had more episodes of weight cycling (4.9 ± 0.4) compared to participants without BED (2.9 ± 0.5) ($p < 0.003$). When comparing the adherence of members of each group to diet, fewer participants with BED had small lapses than non-binge eaters (26% vs 70%) and large lapses happened more in binge eaters than non-binge eaters (37% vs 12%). When comparing the participants who complete the whole program: 17 non-binge eaters and 16/21 binge eaters, a significant difference in percentage of initial body weight lost weren't seen between two groups and after 1 years participants of each group has maintained a weight loss of almost 11% of initial body weight ($11.7 \pm \text{SEM } 2.8$ kg in binge eaters and $10.9 \pm \text{SEM } 1.6$ non-binge eaters). However, if counting the drop outs that happen in binge-eaters' group (4 drop outs), as they refused to participate in follow-up period due to

treatment failure, the treatment-related differences would be influenced. Moreover, it was possible to conclude binge eaters had a greater risk of “early major regain” than non-binge eaters.

Another factor is cognitive restraint which plays role in both losing and maintaining weight is self-monitoring. It includes regular weighing oneself and recording the food intake consumed. Adherence to weight-related behaviors is also important for weight maintenance (Elfhag, 2004). To investigate whether frequent self-weighing is associated with weight loss maintenance a study (Butryn, 2007) with 3003 participants who were members of the National Weight Control Registry (NWCR) and had lost ≥ 30 lbs and maintained it for at least 1 year were recruited. They also should have completed a self-weighing frequency assessment at the time of entry to the NWCR. The results at baseline showed 36.2% of participants had been self-weighing at least once a day, 42.5% not daily but at least once a week and 21.3% reported self-weighing less than once a week. There was an association between more frequent weighing and lower BMI. In addition, the participants who had more frequent self-weighing had a higher scores in cognitive restraint. The self-weighing frequency was examined as a 1-year follow-up and comparing it with baseline data, 72.7% had kept their frequency, 9.6% had increased and 17.7% had decreased self-weighing frequency. The weight gain at 1-year follow-up was considerably higher ($4.0 \pm \text{SD } 6.3$ kg) in people who decreased the self-weighing frequency ($p < 0.001$), while the people who had increased self-weighing frequency or had remained it the same had the less weight gain; $1.1 \pm \text{SD } 6.5$ kg and $1.8 \pm \text{SD } 5.3$ kg respectively.

In addition, having stressful life type or life events including major illnesses, bereavements, personal or family stresses and a busy schedule can facilitate or hamper the process of

losing weight and maintaining the result. On the other hand the capability of individual to cope with the stress as a cognitive and behavioral effort, can also influence the process even more than the number of potential stressors in their life. So it is more prone that individuals who have poor confrontive strategies, have tendency to regulate their mood passively through overeating or sleeping. Unlike them, maintainers can cope with stress or even cravings more effectively (Elfhag, 2004). Although not explicitly stated, motivation is clearly a major factor to maintain corrective behaviors. Similar results have been seen in another study (Korkeila, 1998).

Moreover, social support including participation in a maintenance support group or benefiting support from friends were helpful in weight maintenance while the result seems a bit confusing related to spouse's involvement (Elfhag, 2004). In one study (Wing, 1999) 166 participants were recruited either alone or with 3 friends or family members and then randomly assigned to a standard behavioral treatment (SBT) or SBT with social support strategies. The results showed greater weight loss among participants who were recruited with their friends in the end of treatment at month 4 and for a follow-up at month 10. Moreover, with compare to individuals who were recruited alone in passing SBT, people who joined with their friends and assigned to SBT program plus social support had greater treatment completion and weight-loss maintenance at month 4 and 10(76% completed treatment and 24% maintained the weight loss in earlier compared to 95% completed treatment and 66% maintenance in latter group).

Ongoing professional support and treatment interventions improved vigilance, motivation and encouragement which leaded to better maintenance. The individuals who believe medical issues are the main reason of their obesity are less successful compared to people

who take responsibility of their heavy weight. Furthermore the people who are motivated to lose weight by their own confidence yielded by higher self-esteem or because they feel better and like themselves, are also more successful compared to people who lose weight as a result of being under pressure by others or by their medical issues. The concern for weight, shape and appearance especially in women can predict maintaining the lower weight. The higher initial motivation to lose weight also is associated with more weight loss and low motivation as an obstacle were more reported by regainers. Internal locus of control and feeling of autonomy (Elfhag, 2004) also seem to be related to more attendance to a programme for reducing weight and maintaining it. A feeling of self-efficacy over weight loss, capability of managing situations and emotions and exercise are also positive factors. One study (Williams, 1996) that considered the effect of autonomous motivation as an individual difference and also autonomy supportiveness of relevant social environment including health care staff, in losing weight and maintaining it tested it with a 6-month program of very low caloric intake plus to 23-month follow-up. The results showed a higher autonomous motivation in people who attended the programme more regularly, lost more weight during the programme and maintained the weight loss better.

Dichotomous thinking or white and black approach also negatively can affect the process, compared to a flexible approach in maintainers. It seems depressive symptoms after losing weight was associated with weight regain. Finally a history of weight cycling as repeated losing and regaining weight is associated with regaining weight after treatment so it seems training weight maintaining behaviors prior to starting a new intervention can have a significant role.

Added value of this study

The recent studies that showed being overweight is associated with increased morbidities and mortality are new and in case of mortality is not widely appreciated. To our knowledge, there have been no previous studies that have determined whether or not this information has any impact to change the perception and impact attitudes on overweight/obese individuals towards this problem.

Approach Used in This study

The present study will provide a measure of the prevalence of misperception among increasing overweight/obese population and whether this population can identify their weight status correctly with introducing a credible measurement. We wondered whether or not misperception is less prevalent now that bathroom scales are readily available at low cost and the increasing publicity about BMI. Moreover, we determine the extent to which this population is aware of the associated diseases. We hypothesize that by informing them about the risk of associated diseases, we can improve their motivation and intention to prevent this condition in its earlier stages. Since the focus of this intervention is on health rather than weight, it can also teach them how to use a reliable assessment of weight and prevent future misperceptions about weight. That understanding may reduce the unintended consequence of excessive weight preoccupation which in turn can lead to body dissatisfaction, dieting, disordered eating, and even death from effects of extreme dieting, anorexia, and due to complications from bariatric surgery or from suicide that results from weight-based bullying. (Salas, 2015)

Methodology

This exploratory study was primarily quantitative with some qualitative features designed to assess the self-perception of overweight/obese adult women about their body weight, their intention to reduce weight, their perception of their risk of developing associated diseases and, then evaluated how their perception and intention altered after sharing the morbidity and mortality data.

Sampling method and sample size

Convenience sampling was used, the interviewer approached participants among her friends and acquaintances and their acquaintances and friends, who seem eligible by the interviewer. The number of individuals who declined to participate was planned to be documented, moreover individuals who weren't eligible according to criteria were left out but are reported. Power analysis suggested that 32 subjects with BMI > 25 are at least needed to provide a moderate effect size of 0.5 in a change of weight perception with an alpha error of 0.05 and 0.8 power. Saturation was used to determine adequacy of sample size for qualitative features. Forty participants were interviewed and 34 of them included in the study.

Eligibility Criteria

Non-pregnant overweight and obese women aged over 18 years old with a BMI more than 25 are included. Participants who had current severe diseases under intensive treatment were excluded. It was planned if any of the participants had heard about the details of the study, they would have been excluded.

Preparation of the Questionnaire

The set of questions were in two parts, the first part collected the demographic data about participants. The second part was consisted of in-depth questions. For scaling some questions Likert scaling was used. The presentation about new information about association of diseases with being overweight and obese were prepared and including diagrams. The presentation were written first in Persian and then was translated to English to avoid any misrepresented content caused by translation. Details of the questionnaire are provided in the appendix.

Data collection procedure

After obtaining oral consent, participants were asked how they were informed about the study and how much they know about the interview. Then a demographic questionnaire were completed and, scripted questions before and after educational component were asked. The whole interview was recorded to avoid missing any responses.

Question 1 asked participants to estimate which weight is considered underweight, normal, overweight and obese for their height to help them think about four categories in their mind. Then they were asked to say their perception about their body size. Then the self-perception of body weight expressed by participants in this question were compared with their actual category to evaluate the misperception of body weight among participants.

Question 2 asked whether they consider following a program to reduce their weight to understand their intention. Yes or no responses were followed by a why question and they were encouraged to talk about factors that had motivated them or had hampered the process for them. This question was put here before any other questions to avoid giving

direction to participants' responses, so they could reflect and report their real motivators and obstacles without being influenced by the focus of study which is about the health aspects of overweight/obesity.

Question 3 asked about the perception of participants about the association of seven diseases with being overweight/obese. To evaluate their perception, question gave participants a scale and they gave scores based on the extent of severity they had perceived.

Question 4 asked participants about self-perceived risk of developing same diseases, giving them same scale.

5 Body Mass Index (BMI): at this time, BMI was introduced to participants and its calculation (a person's weight in kilograms divided by the square of his height in meters (kg/m^2)) (WHO, 2000) and classifications (underweight < 20 , $20 \leq$ normal < 25 , $25 \leq$ overweight < 30 , $30 \leq$ Obese).

Then to calculate BMI, weights and standing heights of participants while they were in light clothes and without shoes were measured by the interviewer.

Question 6 asked participants if they agreed the category they are in according to their BMI, to understand if introducing BMI could help them give accuracy to their perception of body weight. If they answered "no" to discover possible factors which bias the perception, the interviewer encouraged them to express their reason.

In **next step** the presentation was presented by the interviewer and the associations of diseases with being overweight and obesity were explained.

Question 7 was repetition of question 3 and asked participant to score the perceived severity of association between diseases and being overweight and obese to see if sharing information about morbidity and mortality association has influenced their perception. To see if the changes in scores are meaningful or not the median of differences of scores for each diseases were considered.

Question 8 asked question 4 again and participants gave score to the extent they think they may develop each of the diseases and the median of differences of scores for each diseases in this their response to this question with their own responses to question 4 is used to evaluate whether sharing information has influenced their self-perceived risk of developing diseases.

Question 9 similar to question 2 asked if they consider following a program to reduce weight and if still no, why. What are the factors that would hamper the process for them? If yes, what are the things that encourage them to follow a lose weight program? Their responses were considered as the motivators and obstacles that motivate or hamper the process of following a program for them. The responses to this question were compared with responses to question 2 to see if sharing data could increase the intention of overweight/obese participants to commit a program to reduce weight.

After the interview, participants were asked not to discuss the details with others to prevent any awareness about the content of study in next interviewees. Immediately after pre-interview consent the interview with next interviewee was also started by asking if they have heard about present study and if yes, what they have heard.

Statistical methods

To verify if sharing information about the consequences of being overweight/obese can change participant's mind about the perceived association between different diseases and being overweight/obese, the difference between the median of the scores for each diseases given by participants before and after sharing information are calculated by Wilcoxon matched-pair test, a nonparametric test, at the significance level of 0.05.

To calculate if sharing information with interviewees had changed their self-perceived risk of developing each of the diseases, the difference between the median of the scores given by participants about self-perceived risk of developing each of the diseases before and after sharing information are assessed by Wilcoxon matched-pair test which is a nonparametric test, at the significance level of 0.05.

To assess the differences between self-reported and measured height and weight, the level of agreement for quantitative continuous variables, Bland Altman approach is used in CRAN. The kappa statistic was used to determine the level of agreement between the measured and estimated BMI from self reported height and weight expressed as the categories: normal, overweight and obese.

Clopper-Pearson Exact method was used to calculate confidence intervals (CI) of proportions for number of people who had more motivation to follow a program to reduce weight.

Results

In this study 40 female participants aged over 18 years old, who were perceived overweight/obese by the interviewer, a convenience sample of acquaintances was used. No one declined to participate in the study and no one knew about the content of interview before the interview. 6 out of 40 participants including 5 normal weight women and 1 overweight subject who was under cancer treatment were excluded in the analyses. So according to inclusion criteria 34 of them were included in the study.

Demographic characteristics of the participants

Age: The participants in this study aged between 22 and 70. A histogram of the distribution of age amongst the participants is shown in figure 1.

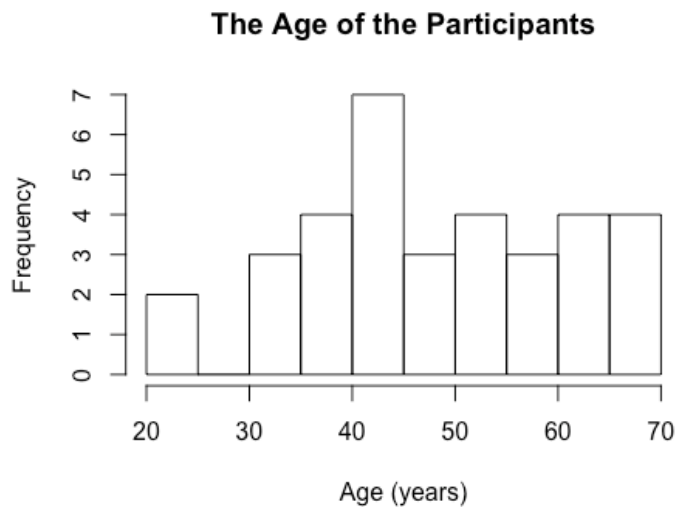


Figure 1: Distribution of the age of the participants by decade.

Marital status: 9 of participants were single and 25 were married.

Occupation: Most participants were housewives but many worked part time or intermittently. Details are shown in table 1.

Table 1: Occupations of the participants

Occupation	No.
Housewives	17
Shopkeeper	3
Teacher	3
Dressmaker	2
Secretary	1
Agriculture expert	1
Accountant	1
Sales manager	1
Chief	1
Server	1
Labor	1
Photographer	1
Dentist	1

The education level of the participants is given in table 2.

Table 2: Education level

Level of Education	No.
Diploma	15
Bachelor	10
Master	3
Post Diploma	2
Completed Guidance School	2
Doctorate	1
Completed Primary School	1

Self-perception of body weight category

Nineteen of participants had a BMI equal to 30 or more which is defined as obese. Sixteen of subjects had a BMI in the range of 25 to <30 which is defined as overweight and 5 participants had normal weight with a BMI ranged in 20 to <25 kg/m².

Comparing the self-reported body weight category of participants in terms of normal, overweight or obese with their body mass index (BMI) calculated with the heights and weights measured by the interviewer, twelve of obese subjects perceived themselves obese and 7 of them reported their size overweight. Among 16 overweight interviewees 13, 2 and 1 perceived themselves as overweight, normal and obese respectively. Three of the 5 normal women reported their size normal and 2 considered themselves overweight. The

results are shown in the table 1. The level of agreement as assessed by the value of Kappa for perceived category and actual category of body weight (underweight, normal, overweight and obese) in participants was moderate: 0.54 ($p = <0.001$).

Table 3: Measured and self-perceived categorization of BMI

Total number of subjects in each category according their BMI		Self-perceived weight category		
		Normal	Overweight	Obese
Normal	5	3	2	0
Overweight	16	2	13	1
Obese	19	0	7	12

BMI is body mass index (kg/m^2): normal is $20 < \text{BMI} < 25$, overweight is $25 \leq \text{BMI} < 30$, obese ≥ 30 .

I wished to answer the question: how accurately do these subjects perceive the weight category. To answer this question kappa statistics were used. The level of agreement of those who were overweight and obese with their perceived assessment of their weight category was assessed. The kappa static ranges between 0 if the agreement is no better than by chance to one if there is perfect agreement. A kappa of 0.54 was calculated suggesting there was moderate agreement.

The next question that arises from these results is whether this misperception is due a misperception of height weight or both.

Self-reported heights and weights vs. measured heights and weights:

Bland-Altman plots were used to compare the self-reported and actual measured weights, heights.

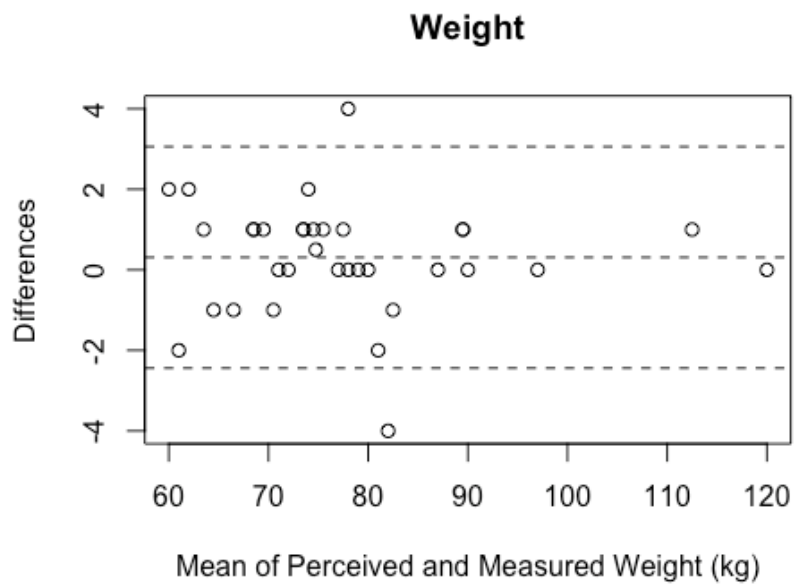


Figure 2: Bland-Altman plot to compare the self reported and actual measured weight.

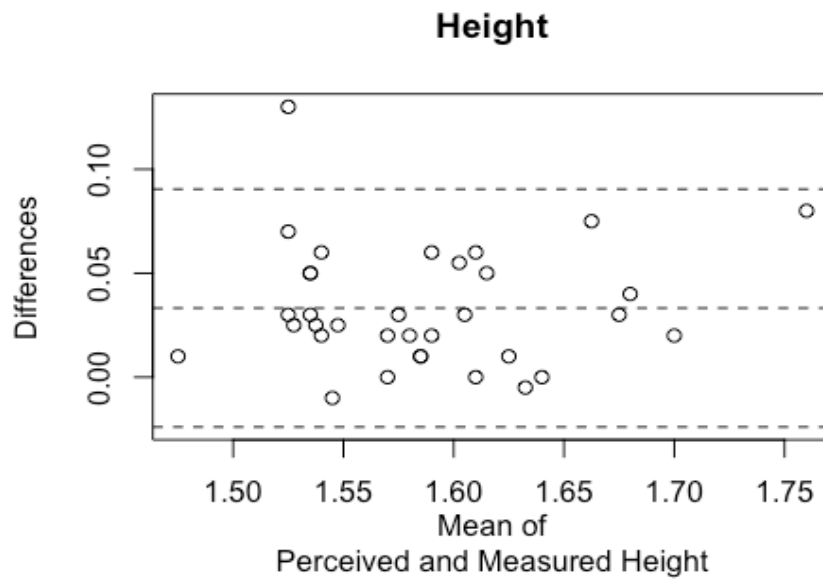


Figure 3: Bland-Altman plot to compare the self reported and actual measured height.

A Bland-Altman plot of the BMI estimated from the perceived weight and height was compared with the actual measured BMI (Figure 3).

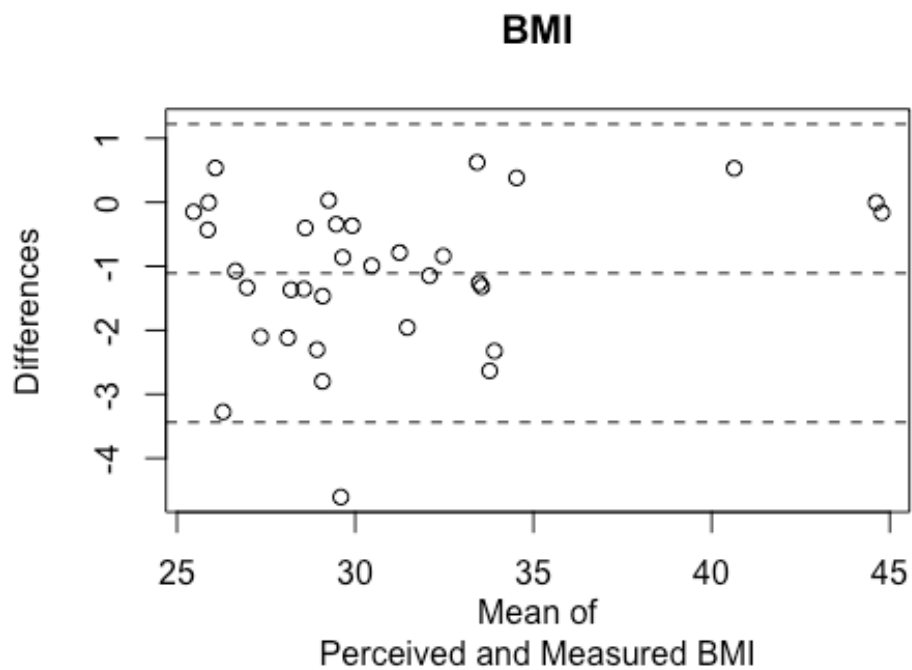


Figure 4: Bland-Altman plot to compare BMI calculated from the self reported weights and heights to the BMI calculated from the measured weights and heights.

Table 4 shows the mean differences and confidence intervals for the perceived versus measured weights, heights and BMI. The mean of measured weights by interviewer with the mean of self-reported weights by paired t-test, the P-value equals to 0.208 which means the difference is not statistically significant Unlike the weight, the difference between the mean of heights measured by interviewer and the mean of self-reported heights were statistically significant ($p < 0.001$) from zero, although the difference was small, 3 cm. Nevertheless, there was a significant difference between the BMI calculated from the self-reported weights and heights and BMI calculated from the measured weights and heights.

Table 4: Mean Differences between Self Reported and Measured Weight and Height

Variables	Mean difference	95% Confidence Interval of means		P value
		Lower	Upper	
Difference between measured and self-reported weight (kg)	0.3	-0.18	0.79	0.208
Difference between measured and self-reported height (m)	0.03	0.02	0.04	<0.001
Difference between BMI estimated from measured and self-reported height and weight (kg/m ²)	-1.11	-1.52	-0.69	< 0.001

Although there was no relation between the difference between measured and reported height with the mean height (figure 2), there was a direct relation between overestimation of height that increases with age.

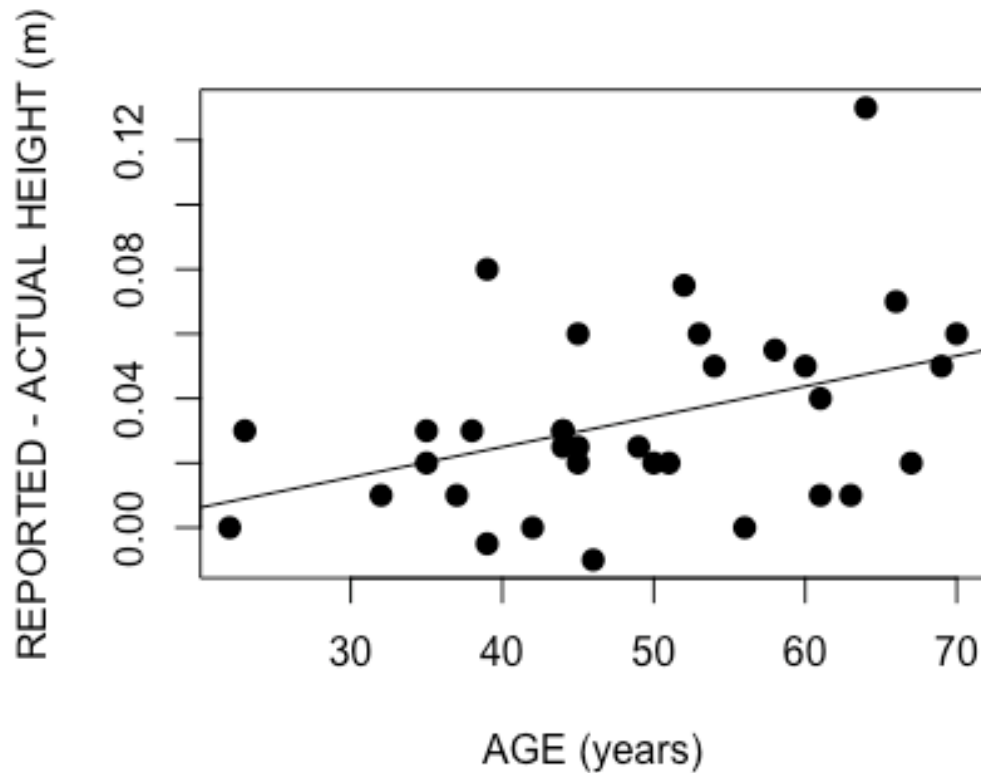


Figure 5: Linear regression of reported minus actual height with age. The slope of the regression line is 0.0009 m/year which was significantly different from zero ($p=0.018$)

When we compare participants' perceived weight category with their actual category as judged by BMI, the kappa value was 0.54. That value suggests moderate agreement. When we compare the weight category calculated from their perceived weight and height with their actual category as judged by BMI, the kappa value was 0.64. That value suggests substantial agreement. Therefore the misperception in weight category was moderate but good but could be improved if participants could calculate their BMI.

Participant's perception about severity of association between seven diseases and being overweight/obese before and after sharing information about their association.

To compare the answers of interviewees about the perceived severity of association between specific diseases and being overweight/obese before and after sharing information about their association, the nonparametric Wilcoxon matched-pair test for two samples was used.

The results are summarized in Table 5. Each item was scored on a scale of 1 to 5: 1 is not serious, 2 is a little, 3 is somewhat serious, 4 is very serious, 5 is extremely serious

The first row in the table 5 demonstrates that there was a significant increase among participants in the median of the perceived risk of developing type 2 diabetes mellitus after sharing information about the mortality and morbidity of being overweight/obese.

The second row in the table 5 demonstrates that there was a significant change among participants in the perceived risk of developing cardiovascular diseases after sharing information about the mortality and morbidity of being overweight/obese. Although there was no change in the median, there was a reduction in the interquartile range suggesting a shift towards an increased perception of risk.

The third row in the table 5 demonstrates that there was a marked increase among participants in the median of the perceived risk of developing cancer after sharing information about the mortality and morbidity of being overweight/obese that was statistically significant. There was also a reduction in the interquartile range suggesting an increased clustering of scores towards an increased perception of risk.

The fourth row in the table 5 demonstrates that there was a marked increase among participants in the median of the perceived risk of developing asthma after sharing information about the mortality and morbidity of being overweight/obese that was statistically significant.

The fifth row in the table 5 demonstrates that there was a significant change among participants in the perceived risk of developing gallbladder disease after sharing information about the mortality and morbidity of being overweight/obese. Although there was no change in the median, there was a reduction in the interquartile range. This result suggests that there is a reduction in the dispersion of the responses but it is unclear whether or not there was a significant change in the perceived risk.

The sixth row in the table 5 demonstrates that there was a significant increase among participants in the median of the perceived risk of developing osteoarthritis after sharing information about the mortality and morbidity of being overweight/obese. There was also a reduction in the interquartile range suggesting an increased clustering of scores towards an increased perception of risk.

The seventh row in the table 5 demonstrates that there was a significant increase among participants in the median of the perceived risk of developing chronic back pain after sharing information about the mortality and morbidity of being overweight/obese. There was also a reduction in the interquartile range suggesting an increased clustering of scores towards an increased perception of risk.

In sum, there was increased perception of risk of developing type 2 diabetes mellitus, cardiovascular disease, cancer, asthma and osteoarthritis but not for gall bladder disease or chronic back pain.

Table 5: Strength of Association between Disorders and Being Overweight/Obese Measured Before and After Being Shown the Mortality and Morbidity Data

Disorder	Before		After		Significance
	Median	IQR	Median	IQR	P value
Type 2 diabetes	3.5	1	4	1	0.001*
Cardiovascular diseases	4	1.75	4	1	0.041*
Cancer	2	2	4	1.75	<0.001*
Asthma	1	2	3	2	<0.001*
Gallbladder disease	3	1.75	3	1	0.001*
Osteoarthritis	3	2	4	1	0.014*
Chronic back pain	3	2	3.5	1	0.076

IQR is the interquartile range [3rd quartile (75% level) minus the 1st quartile (25% level)]

* = attained statistical significance (p<0.05)

Participant's perception about the self-perceived risk of developing each of the diseases before and after sharing information about their association:

To compare the answers of interviewees about the self-perceived risk of developing each of the diseases (diabetes type 2, cardiovascular diseases, some types of cancers, asthma, gallbladder diseases, arthritis and chronic back pain) and being overweight/obese before and after sharing information about their risk, Wilcoxon matched-pair Test for two samples

which is a nonparametric test is used. The degree of risk was recorded on a scale of 1 to 5: 1 = not at all, 2 is a little likely, 3 is somewhat likely, 4 is very likely and 5 is extremely likely.

The first row in table 6 shows no significant difference in the median of the responses about their risk of developing type 2 diabetes mellitus before and after sharing information about the risk. There was a reduction in the interquartile range which resulted in a significant reduction in the dispersion of responses which suggests the participants consolidated their view that the risk for them was only a little.

The second row in table 6 shows no statistically significant change in the median or the interquartile range. This result suggests that showing participants' information about health risks associated with being overweight/obese did not change their perception of their risk to develop cardiovascular disease.

The third row in table 6 shows statistically significant change. The median increased. This result suggests that showing participants information about health risks associated with being overweight/obese did increase their perception of an increased risk to them of developing cancer.

The fourth row in table 6 shows statistically significant change. The median increased. This result suggests that showing participants information about health risks associated with being overweight/obese did increase their perception of an increased risk to them of developing asthma.

The fifth row in table 6 shows no significant difference in the median of the responses about their risk of developing gallbladder disease before and after sharing information about the risk. Nor was there a difference in the interquartile range.

The sixth row in table 6 shows an increase in the median of the responses about their risk of developing osteoarthritis before and after sharing information about the risk. But there was a decrease in the interquartile range. These differences did not attain statistical significance.

The seventh row in table 6 shows no significant difference in the median of the responses about their risk of developing chronic back pain before and after sharing information about the risk. Nor was there a difference in the interquartile range.

In sum, the only significant changes were in perceived likelihood of developing of cancer and asthma in themselves by showing the information about the effects of being overweight/obese on mortality and morbidity.

Table 6: Change in Perceived Likelihood That the Participants Might Develop the Seven Disorders Before and After Shown the Data

Disorder	Before		After		Significance
	Median	IQR	Median	IQR	P value
Type 2 diabetes	2	2	2	1.75	0.033*
Cardiovascular diseases	3	2	3	2	0.159
Cancer	2	2	3	2	0.015*
Asthma	1	1.75	2	2	0.002*
Gallbladder disease	2	2	2	2	0.642
Osteoarthritis	3.5	3	4	2	0.371
Chronic back pain	3	2	3	2	0.822

IQR is the interquartile range [3rd quartile (75% level) minus the 1st quartile (25% level)]

* = attained statistical significance (p<0.05)

The responses to whether they consider following a program to reduce weight.

When participants were asked if they consider following a program to reduce their weight, they replied either yes or no. In addition they talked about the reasons which motivated them or the challenges that are obstacles in the way of reducing weight. The results were as below:

- Almost all participants (32 out of 34 participants) (0.80-0.99, 95%CI) were following or someday had followed a program to reduce weight, including going on a diet or doing exercises or pursuing other therapies like acupuncture or traditional ways. The diet and exercises could be under self-disciplined program or under a physician prescription.
- Eighteen of them at the time of interview, were trying to reduce weight in some ways including eating small portion of dinner, eliminating carbohydrate, sugar or oil in their diet and exercising, but only two of them had a really disciplined and regular program to reduce weight, one who went to gym regularly and one went on a diet and did exercise under a physician's recommendations, both were obese with BMI 32.4 and 32.6 respectively. After sharing data all of these 18 people (0.81-1.00 ,95%CI) mentioned they were more motivated to reduce weight.
- Fourteen of these 32 women at the time of interview, didn't do anything to reduce weight although they had tried different ways in previous months or years. After sharing data 12 of these 14 women (0.57-0.98, 95%CI) said they had more motivation to do something to reduce weight and 2 of them said they still didn't have any motivation to do so.

- Ultimately, after the interview, only 1 of the participants who was consulting with a physician, thought about being remained under a physician's schedule. The other 31 women who were motivated, didn't tend to go to a physician. They were only motivated to follow their own program that someday had found beneficial and 3 of them were motivated to try the ways they were thinking before, including using an advertised medication by 1 interviewee with BMI 29.2 and going under medical surgeries by other 2 interviewees with BMI 32.8 and 44.6.
- Only 2 of participants had never tried to reduce weight and didn't accept their weight category. Both were overweight with BMI 25.5 and 29.2 and were satisfied with their weight and believed their weight was acceptable for them and they thought they didn't need to reduce weight before and after sharing data. First one (BMI=25.5, aged 44, dressmaker) believed her weight is proper for her age and with having two children. The other one (BMI=29.2, aged 70 and dentist) believed her weight is perfect for her because her body needs to store estrogen in fat tissue since her body doesn't secrete it anymore.

Motivators: The reasons that gave participants motivation to follow a program were varied. The strongest reason that was mentioned by 24 of interviewees were for being healthy and then for better appearance with 14 participants. Seven of participants particularly pointed to comfort in movement and 5 women said being fitted for tight and beautiful clothes motivated them to reduce weight. Four women had followed a program to have more energy and for being fresh and 3 women for relieving their pain especially their back pains. The other reason mentioned by two was their family members were on diet and two others were strongly encouraged by family members.

Table 7. Reasons which motivate participants to reduce weight.

Motivators	No. of participants
Being healthy	24
Better appearance	14
Comfort in movement	7
To be fitted for tight and beautiful clothes	5
To have more energy and for being fresh	4
To relieve pain especially back pains	3
Family members are on diet	2
Family members encourage her to reduce weight	2
For being perfect as a perfectionist	1

Obstacles: When participants were expressing the obstacles in their way to reduce weight, 11 women mentioned that going on a diet is mentally hard for them because they can't control their appetite, or diet itself gave them stress. Nine participants also mentioned unsuccessful attempts following different types of therapies and diets in past years or months had made them unmotivated. Lack of time to follow a regular program also was mentioned by 8 participants (23.5). Six women were concerned by the consequences of strict diets under nutritional physicians on the skin, hair and mood, either experienced by

themselves or experienced by a close friend or relative. Five of women couldn't trust nutritionists because they thought they were not effective or they just work to earn money so they are not honest in process of treatment.

Although six of participants mentioned they are concerned by consequences of strict diets that nutritionists gave to people and five women said that they didn't trust nutritionists as they saw the process of helping people like a business, only one of participants were under supervision of a nutritionists and tend to continue it and none of others tend to go to a physician or nutritionists to consult about their weights.

Table 8. Obstacles in the way of reducing weight

Obstacles in the way of reducing weight	No. of participants
Going on a diet is mentally hard due to stress caused by uncontrollable appetite	11
Unsuccessful attempts	9
Lack of time to follow a regular program	8
Concerned by consequences of strict diets under nutritional physicians experienced by others	6
Can't trust nutritionists because they are not effective or honest (they just want to earn money)	5
Stress increases their appetite	5
Believes it is normal to increase weight when someone ages	5
Disappointed	4
Can't do exercise due to pain and health problem	3

Having no motivation and concern at this period of time	3
Household chores and physical activities at work are enough	3
High cost of being under a physician care and joining gyms	3
Diet makes her weak and unable to do their routine physical activities	2
Being so lazy to follow a reducing weight program	2
Unsafe surrounding environment to go for a walk or doing exercise	1
Unsatisfying initial weight loss	1
Living alone obstacle following a suitable lifestyle	1

Additional information Obtained During the Interview

- Four of participants had tried acupuncture therapy, who were all obese (with BMI 44.6, 35.0, 34.3 and 33.1).
- Five women including 2 overweight and 3 obese women believed the content of mind was very important and if you were optimistic and if you did not think about diseases you would not get them.
- Only 2 people knew cancer is related to weight and even one of them mentioned if her doctor had not told her before she would not accept my information to change her mind about the association of cancer and being overweight/obese. One of the

other participants looked suspicious to information because she said she hasn't heard them from her personal physician.

- Four women gave low scores for self-perceived risk of developing diseases and expressed the scare and fear they have about them.

Discussion

This study aimed to explore the self-perception of body weight and of the consequences of excess weight for health among overweight/obese non-pregnant women over 18 in Karaj, Iran, before and after the intervention of introducing an accurate assessment of body weight (BMI) and sharing new data that even being overweight is associated with increased morbidities and mortality.

Misperception of BMI weight status

The findings regarding to assessing how accurate participants perceived their BMI weight status is based on the comparison between self-reported body weight category of participants and their actual category($\kappa = 0.54$), that value suggests moderate agreement.

This result lead us to the question that whether this misperception is caused by misperception of weight, height or both. Unlike Mueller study (2014) that participants had underestimated their weight which lead to underestimation of BMI weight category, the misperception that subjects had about their weight status in present study does not arise from the inaccuracy of their weight because there is a good agreement between the self-reported and measured weight (mean difference=0.30 kg, p-value = 0.208) probably due to widespread availability bathroom scales amongst this population. Participants expressed during their interview that they regularly weigh themselves although with varying frequencies. On the other hand, there is a small significant overestimate of their height (mean difference = 0.03 m, p-value = 0.001), similar results were seen in Nyholm's study (2007) too regarding to the group of older women who had overestimated their height. In

present study, twenty-nine out of 34 participants overestimated their height. Three of remaining were measured recently by a nutritionist or physician and they reported their height accurately. Since Iranian women are not tall and a tall height is appreciated by most of them it may be the underlying reason that most of them reported their height higher than their real height. Another possibility is that participants may not appreciate the shrinking that occurs with age due to osteoporosis for example. In keeping with this hypothesis, we did find a positive relation between the overestimate of height with age. Such overestimation of height was seen in a study (Briot, 2010) that evaluated the accuracy of patient-reported height loss among postmenopausal women. Their result showed participants reported their current height 2.1 (SD 2.5) cm lower than the tallest recalled height and 2.4 (SD 2.6) cm lower than the measured current height and the most related factor which predicted a loss of height of 3 cm or more was age (OR 1.09; 95% CI 1.08 -1.10) and then previous vertebral fracture (OR 1.49; 95% CI 1.16-1.91), previous nonvertebral fracture (OR 1.26; 95% CI 1.06-1.51), thoracic kyphosis (OR 2.07; 95% CI 1.69-2.55), scoliosis (OR 1.35; 95% CI 1.12-1.63), back pain (OR 1.22, 95%CI 1.07-1.39) and osteoporosis (OR 1.39; 95% CI 1.20-1.60). Another cross-sectional study (Sorkin, 1999) also has showed that height loss happens when people age.

This overestimate of height may lead us to this understanding that it has caused the underestimation of BMI weight category. Actually, that overestimation of height did lead to a significant difference in the BMI of actual compared with self-reported measurements (with kappa was 0.64 that suggesting a substantial agreement). Thus although, one reason for the misperception of the weight category is misunderstanding of the category into which they belong, But it is also important in weight loss programs that subjects are taught how

to calculate their BMI adding to classify themselves in the correct category. They both could improve their perception.

Understanding severity of associated risk of different diseases and being overweight/obese before and after the intervention

To explore how the intervention which was sharing information about association of different diseases and being overweight/obese can increase participants' perception about severity of these association was scored on a Likert scale. The median and the interquartile of scores were compared before and after sharing information. The findings showed a significant increase in the medians of type 2 diabetes (3.5 to 4) and a significant median difference in first and second scoring (p-value=0.001), same for cancer (2 to 4, p-value=0.041), asthma (1 to 3, p-value=0.001), osteoarthritis (3 to 4, p-value=0.014) and shorter interquartile range [3rd quartile (75% level) minus the 1st quartile (25% level)] for cardiovascular diseases (1.75 to 1), cancer (2 to 1.75), gallbladder disease (1.75 to 1) and osteoarthritis (2 to 1) which reflects a shift towards an increased perception of risk.

A considerable increase in median of second scoring for cancer and asthma reflects how little they knew about the association between these two diseases and being overweight/obese were perceived by participants. From 11 participants who scored 3 or more the severity of association of asthma and being overweight/obese, 5 had suffered from asthma in their life and it was a hint for them that it can be associated, at least in part, with their weight.

Only two interviewees were aware of the associated risk for cancer including the only obese participant who tried to be under a physician treatment to reduce weight and an

overweight one who was excluded from the study since she was under cancer treatment, both were informed through their physicians.

Although participants gave higher score for this association with cancer after sharing information but it seemed they did not really believe this association and genes were accepted as the main role player by participants and only three women mentioned lifestyle as another factor. It was also mentioned by the woman who was under treatment that if her own medical professional had not informed her about this association she would have never accepted it from me. The attitudes shown by the interviewees implied how important it is that physicians and medical professionals inform their overweight/obese patients about potential risk of their weight.

Although the median of scores for associated risk of chronic back pain with overweight/obese increased from 3 to 3.5 but the difference is not statistically significant. Twenty-three of 34 participants were suffering from different types of chronic back pain at the time of the interview or before and understanding this association was not hard for them. It seemed having the experience of disease by themselves or overweight/obese relatives or friends worked as a criteria for them to consider associated risk for that disease.

Self-perceived risk of developing diseases by participants before and after the intervention

There were significant changes in the median and difference in the median of the responses about their risk of developing cancer (2 to 3, $p=0.015$) and asthma (1 to 2, $p=0.002$) and it shows if the participants become aware of the associated risk of these diseases for overweight/obese people, they may consider a higher risk for themselves to develop these

diseases. There were also a meaningful difference in the median of responses for diabetes type 2.

Since almost all of participants mentioned in their responses that diabetes is mainly inherited by the genes, being informed about associated risk with higher weight helped them to put themselves in higher risk if they have both family history of the diseases and a higher weight.

The difference of medians for other four diseases including cardiovascular diseases, gallbladder diseases and osteoarthritis and chronic back pain were not statistically significant. The association of risk of developing these diseases and higher weight were something that most participants were aware about it.

Overall, the participants who were afraid of developing diseases consider a higher risk for themselves to develop the diseases that they consider associated with being overweight/obese. In addition, these participants perceived a higher risk for themselves regarding to diseases that thought they are inherited by genes and participants had family history of it. This group of participants also increased the self-perceived risk of developing these diseases after understanding that they were related to higher weight too.

There were a group of 5 participants who believed they would not develop diseases if they stay optimistic. They believed if they think about getting the diseases it could cause them to really develop them and if they consider themselves healthy they would stay healthy as the content of mind play role in health status. Another group (5 women consisted of 4 obese) was participants who were extremely afraid of developing diseases and expressed it in their words and faces during the interview especially at the time of the questions related to self-

perceived risk of developing diseases. They tried to not give a high score to self-perceived risk as thinking about it put them in stress. After sharing data these two groups didn't change the score or did it cautiously.

The responses to whether they consider following a program to reduce weight

The responses of participants when they were asked if they consider following a program to reduce their weight. We used their responses as an indicator for evaluating how much the intervention consisted of information about associated risk of morbidity and mortality with being overweight/obese works to give them motivation to reduce their weight.

The intervention was significantly successful in increasing motivation to follow a more regular basis to follow a program in participants (100%, 81-100%, 95%CI, n = 18) who cared about their weight and at the time of interview they were trying to reduce weight in their ways including eating small portion of dinner, eliminating carbohydrate, sugar or oil in their diet and exercising.

The intervention were also quite successful for women (78%, 57-98%, 95% CI, n = 14) who were not trying to reduce weight at the time of the interview but had strived in previous months or years. It seemed unsuccessful attempts made two of them completely disappointed that even more information about health consequences did not motivate them to restart a program to reduce weight.

Two overweight women who had never attempted to reduce weight still didn't have any motivation to do so. One who (BMI=29.2) was a dentist knew herself enough knowledgeable and brought biological reasons that she does not need losing weight and the other one (BMI=25.5) who had a physician relative which had told her she was a little overweight.

Since one of them knew herself educated and the other one who had a physician in her family would not accept medical recommendation from other sources easily.

Acupuncture therapy

Four of participants who were all obese with BMI=44.6, 35.0, 34.3 and 33.1, mentioned experience of acupuncture therapy when talking about different types of attempts they did. All of these four participants were satisfied with the result of this type of therapy but they gained weight again very soon. All of these four participants had tried different therapies and ways to reduce weight and all mentioned they were not mentally comfortable with diet and they could not follow a long program to maintain their weight. Moreover, they had very low self-efficacy regarding to their ability to control their weight and believed controlling their weight is out of their hand and their lifestyle (external locus of control) and showed very depressive and disappointed feelings. They also said all the time they had bad feelings about their eating and felt guilty about it which caused them stress, 2 of these 4 gave very low scores (1 or 2) while expressing self-perceived risk of developing diseases even after the intervention. 3 of them showed a feeling of confusion and said they really didn't know what they should do. One of them also was one of the two participants who thought about medical surgeries to reduce weight. It seemed women who sought passive ways (therapies which does not need direct personal involvement like diet and doing exercise) to reduce weight had shared characteristics. Mostly they did not really believe they could reduce weight actively and their self-efficacy was low. Similar results were seen in Teixeira study (2009) regarding to self-efficacy.

Being under a medical supervision

When talking about following a program to reduce weight, five of participants were concerned about consequences of strict diets under nutritionists' supervision experienced by themselves or others and two of participants pointed to high cost of being under a medical supervision. Although overall 6 people showed their worries and problems with being under a medical supervision but none of participants (except one who was supervised by a physician) showed a tendency to go to a physician or nutritionist to pursue a diet. It seems there is a lack of trust in nutritionist and being under their supervision. The participants preferred to follow a diet which had been done successfully by a friend or relative or one diet that they had read about it.

Other Obstacles and Motivators

Almost all of participants (32 out of 34: 94% (95%CI 79-99%)) had been on a strict and serious diet for a while and then dropped out due to either unsatisfying initial weight loss as seen in Foster study (1997) or stressful pressure caused by diet had lead them to lose restraint or otherwise disinhibition similar to what Elfhag (2004) had mentioned in his study. So it seems flexible cognitive restraint as Teixeira (2009) had pointed to as a positive factor plus to a realistic target in reducing weight can have a positive role in pursuing a successful diet. Moreover the strategies which help participants control their stresses related to either diet or everyday challenges can help them control their appetite since three of participants mentioned stress increased their appetite and lead them to uncontrollable eating.

In one study Wing and colleagues showed (1999) social support can increase treatment completion and weight loss maintenance in several pointed time. In present study three of

participants had benefited from the support of their family members either by being on a diet too or only encouraging participants to reduce weight. One of the participants also benefited from a continuous professional support. Regardless of the results these supports obviously had increased the motivation of mentioned participants for following a program.

Conclusion

The primary purpose of this study that was exploring the self-perception of body weight and the consequences of excess weight for health among overweight/obese non-pregnant women and assessing the effects of an intervention which was sharing new information about association of higher risk of morbidities and mortality with being overweight and obese, 34 of interviewees were eligible according to inclusion criteria. The result showed a moderate agreement between self-perceived body weight category and actual body weight category ($\kappa = 0.54$). Although the BMI can be effected by wrong estimation of weight or height and participants had overestimated their height and as a result a small underestimate of BMI. The underestimation of BMI was only -1.1 kg/m^2) was less than would be expected to change the BMI category. It seems one reason for this misperception of body weight was misunderstanding of the category into which they belong although this misperception could be improved if subjects calculate their BMI. Therefore, it is important in weight loss programs that subjects are taught not only how to calculate their BMI but also to classify themselves in the correct category.

Regarding to the perceived associated risk of morbidities and mortality and also self-perceived risk of developing diseases, sharing information about increased risk of morbidities and mortality for being overweight and obese, can help participants to perceive higher risk for excess weight. Although some people affected by extreme beliefs like “the

health status is relied on the content of mind” may accept the association or severity of it later than others. In addition the people who really fear getting diseases may satisfy with this idea that if they stay optimistic about their own health status, they will not get the diseases. It seems these types of comments is a reflection of their psychological defense mechanisms that help them to control their worries. Moreover, participants better accept the associated risk for being overweight/obese or themselves as a person with excess weight if they are informed by a professional or their own physician who they trust more. Hence it is very important for medical professionals to inform their overweight/obese patients about associated risk of excess weight. It is also preferred that any program targeted to inform this group of people benefit from a group of professionals to do it.

Limitations

Since there is sensitivity regarding to weight among overweight/obese women, the method of sampling and being friend or acquaintance with interviewer helped participants to be open during the interview. Moreover, the questions and order of them were designed in a way to make least direction or bias in responses. Nevertheless, we don’t know how much increased scoring after sharing data is affected by participants’ intention to satisfy the interviewer (although the atmosphere of the interview wasn’t judgmental or encouraging to increase scores) or any other psychological factor. It is also possible that participants forget part of information after a while so it may affect the scoring of perceived risks after a while.

Moreover, although the interview and process of study were adequate for the purposes of study, having one or several follow-up interviews after some periods of time could help to evaluate how much of one session of sharing information could be remembered by

participants and see if they followed a program to reduce weight and measure the probable weight loss among them.

Recommendation for future research

To benefit from interventions similar to shared information in this study, it is necessary to know how much of this session can be remembered in some periods of time and how it really impacts the process of losing weight in this group of people. It is also helpful to know how much it can be effective if information be shared by personal physician or others sources like Medias. Future studies that compare the motivations and obstacles between overweight people and obese people also can be beneficial, it may affect the presentation of sharing information to be fitted with the need of each group and find a way to help them overcome the obstacles that are more common in each group.

Appendices

Appendix 1:

Pre-interview consent

There has been some new large study about body weight of people throughout the world that was published in August 2016 in a major medical journal. I am conducting a study of perceptions of body weight for a thesis as part of a Master degree. I want to find out how these data impact what you think about your weight. You were chosen because I am asking everybody with whom I come in contact with outside my immediate family. Your name will not be recorded. All records will be deleted when my thesis work is completed. I want to show you some new data that has been published about body weight and ask your thoughts on this information. In order to do this I will need to record your height and weight. The entire interview will take about 20 minutes.

Have you heard about my study?

If yes, how did you hear about my study?

Would you be willing to participate?

[If unable to participate, ascertain why? Record your impression of body build]

Appendix 2:

The questionnaire and in-depth interview questions

General information

age,

gender,

marital status,

pregnancies,

children

occupation,

level of education,

smoking history,

personal physician,

self-reported height,

self-reported weight,

1. For someone of your height, what you would consider to the underweight, normal weight, overweight or obese? In which category do you think you are?

Record category

2. Would you consider following a program to reduce your weight? Why?(Probe reasons: improve health, body appearance, failed previous attempts)

Record category

3. The following diseases have been associated with being obesity.

Type 2 diabetes mellitus,
all cardiovascular diseases except heart failure,
nearly all types of cancer,
asthma,
gallbladder disease,
osteoarthritis,
chronic back pain.

How serious are they related to obesity using the following scale?

1=not serious, 2=a little, 3=somewhat serious, 4= very serious, 5=extremely serious,

Do you have any of these conditions?

Record responses

4. Do you think that you might develop each one of them using the following scale?

1 = not at all, 2=a little, 3 = somewhat, 4=very, 5 extremely likely

Record response

Inform the subject about the consequences of being overweight/obesity.

5. I can measure your height and weight now and calculate into which of the categories you would fall. Is it all right with you if I make those measurements now?

Record measured height, weight and BMI. If the subject declines, probe for the reason.

Inform the subject into which category are fall.

6. According to these data, your body weight exceeds the normal. Do you agree with that assessment?

Record response (Probe reasons for disagreement)

Now I have provided this information to you I would like to ask you the some of the same questions again to see if you have changed your opinion.

7. The following diseases have been associated with being obesity.

type 2 diabetes mellitus,
all cardiovascular diseases except heart failure
nearly all types of cancer
asthma
gallbladder disease,
osteoarthritis
chronic back pain

How serious are they related to obesity using the following scale?

1=not serious, 2=a little, 3=somewhat serious, 4= very serious, 5=extremely serious,

Record response

8. Do you think that you might develop each one of them using the following scale?

1 = not at all, 2=a little, 3 = somewhat, 4=very, 5 extremely likely

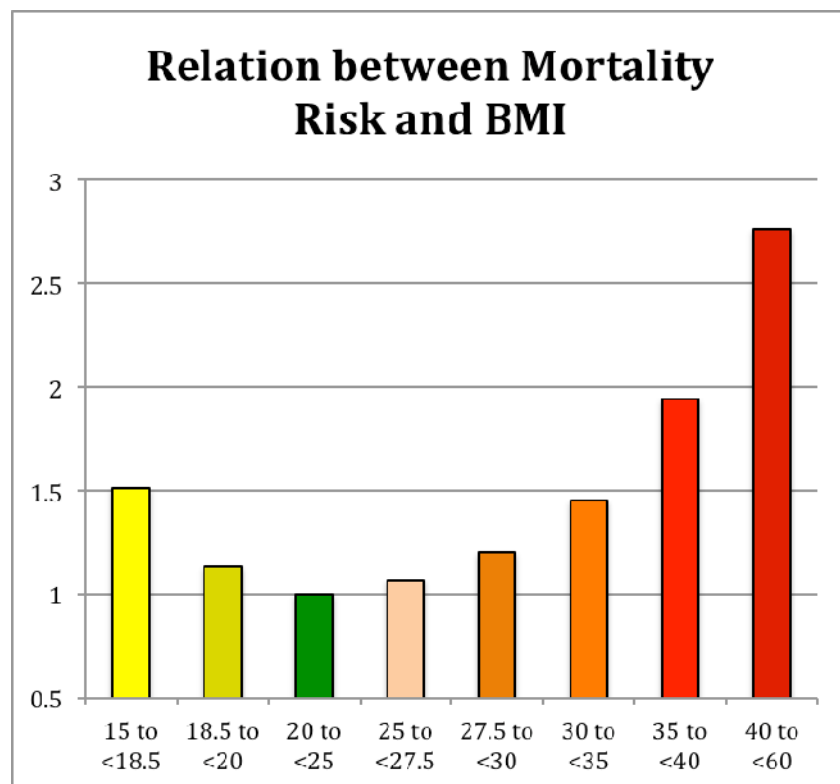
Record response

9. Would you consider following a program to reduce your weight? Why? *Record response (Probe reasons: improve health, body appearance, failed previous attempts)*

Appendix 3:

Presentation about BMI and mortality and the association of BMI with morbidities

The authors of this large study found from people on four continents that being underweight is associated with a shorter life expectancy if a person is underweight, overweight and even more if they are obese. The hazard of falling outside the normal range increases from 7% to 276%



From **Body-mass index and all-cause mortality: individual- participant-data meta-analysis of 239 prospective studies in four continents** *The Global BMI Mortality Collaboration** Lancet. 2016 Aug 20;388:776-86

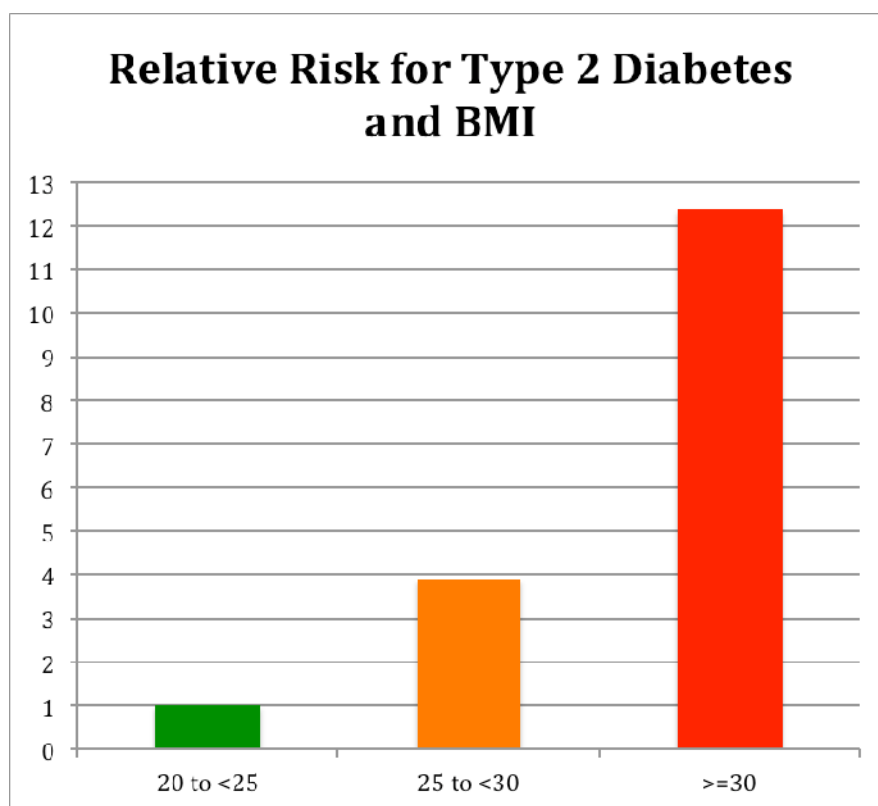
Association of Diseases with Overweight/Obesity

A review of 89 articles published in 2009 showed a statistically significant increased risk being overweight and obese with the following diseases.

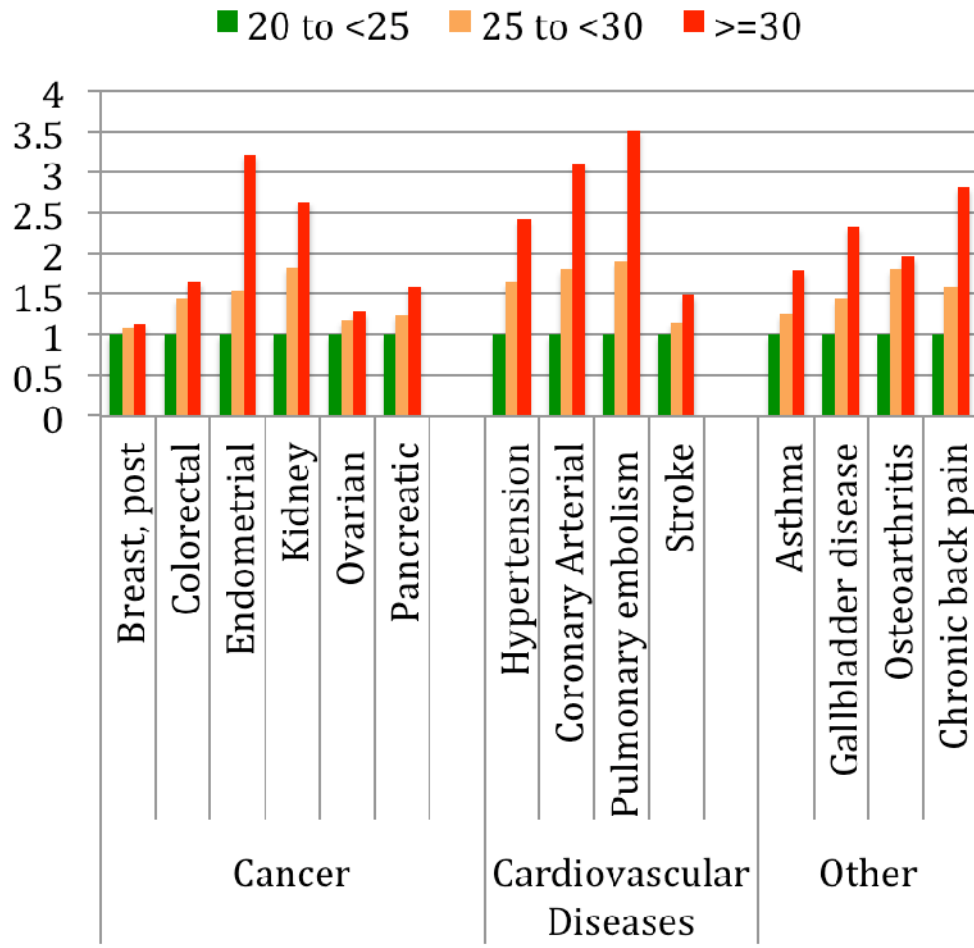
- **Type 2 diabetes**
- **Nearly all types of cancer**
- **All cardiovascular diseases except heart failure**
- **Asthma**
- **Gallbladder disease**
- **Osteoarthritis**
- **Chronic back pain**

*The strongest association for being **overweight** was with diabetes in women **nearly 4 times the risk** compared with normal weight*

*Strongest association for **obesity** was with diabetes in women **over 12 times the risk** compared with normal weight*



Relative Risk Between Cancer, Cardiovascular & Other Diseases and BMI



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