

MSc. Thesis

Perception of Overweight and Obese People about their Body

A systematic Review

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Abstract

This study was a systematic review conducted to address the perception of overweight and obese people regarding their weight and the factors that influence weight perception. The aim of this study was to give some insight to health intervention planners about the issue from the subjects' point of view. In this review relevant articles were extracted from 4 electronic data bases such as Scopus, PubMed, Web of Sciences and Medlin using developed search terms. In total 38 studies conducted in different countries which met the inclusion criteria were included. Out of all, 14 studies were perceived to be high quality, 19 studies of medium quality and 5 studies were considered to be of low quality based on the quality assessment criteria.

This review has revealed that many overweight and obese people underestimate their weight. In addition, it was found out that many normal weight people overestimate their weight. Independent of BMI, females were more likely to overestimate their weight, to be less dissatisfied with their body and more desired to be thin. And males were more likely to underestimate their weight, more likely to like the way they look and to be more confident about their physical competence. With regard to the factors that influence weight perception, it was revealed that there were many factors that contribute significant effect on weight perception. These factors are presented in this study as demographic, socio-cultural-cognitive and health related factors. From all the factors, demographic factors were the most studied factors while others were underrepresented. Therefore, further research is needed to explore the strength of the influence of the underrepresented factors on weight perception. Moreover, health interventions that increase awareness of ideal weight status across all BMI groups but with different messages should be promoted.

Key Words:-

Overweight, obesity, perception, body image, systematic review

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Chapter 1

1.1. Introduction

The burden of overweight and obesity is one of the biggest worldwide public health problems and is the 5th leading risk factor for global deaths [1]. According to the report of the World Health Organization (WHO), 35 % and 11% of adults (≥ 20 years) were overweight and obese in 2008 [1]. Moreover, about 65 % of worldwide population lives in regions where more people are dying from overweight and obesity than from underweight [1]. It is also estimated that by the year 2030, about 57.8% (3.3 billion) of adult population worldwide might be overweight or obese, with higher rates in developing countries than in developed countries [1, 2].

Overweight and obesity are associated with increasing burden of chronic diseases such as type II diabetes, cardiovascular diseases, cancers, hypertension, gallbladder diseases, musculoskeletal disorders and reduced health related quality of life [1, 3 - 7]. Globally, overweight and obesity accounts for 44% of the overall diabetes burden, 23% of the ischemic heart disease and from 7% - 41% of some types of cancers [1]. Each year about 2.8 million people die globally due to health problems associated with being overweight and obese [1]. Furthermore, being overweight/obese can have significant effects on adolescents self-image and psychological wellbeing [8, 9]. Adolescents who are overweight are often maltreated by their peers and experience higher rates of isolation, grief, anxiety, low body satisfaction and low self-worth than adolescents with normal weight [8, 9]. Some overweight/obese adolescents, particularly those in the lower grades and girls, are more likely to experience depressive symptoms and suicidal attempts if exposed to weight-related teasing [10, 11].

Weight loss has shown significant outcome in reducing overweight and obesity related health risks [12]. However, for overweight and obese people to be able to participate in such intervention programs, the awareness of being overweight or obese is important [13]. The perception of being overweight or obese and having increased awareness of weight related health risks are strongly associated with attempting to lose weight and developing healthy behaviors, such as dieting, physical activity and to use diet pills and purge/laxatives [12-18]. Overweight individuals who perceived themselves as being overweight were more likely to practice weight control behaviors and to attempted weight loss than those who misperceive their weight [13-18].

In addition to misperception of being overweight or obese, perceived weight related stigma and discrimination have negative influence on the lifestyle of overweight and obese people. Overweight individuals who have perceived weight related stigma and discrimination have higher chances of displaying unhealthy behavior in dieting and physical activity [19, 20]. Although several interventions have been conducted to reduce the social stigma and discrimination, systematic reviews of researches on overweight and obesity in the general public indicated that, it is still persistent. Furthermore, those reviews have revealed that anti-fat prejudice interventions did not bring noticeable change despite the

growing knowledge of the causes of overweight and obesity [21, 22]. Thus, it is highly likely that overweight and obese people will develop negative self-perception related to their body which in turn could affect their attempt to lose weight.

1.2. Problem Statement

Despite several efforts have been made to control and prevent the burden of overweight and obesity, it is still continuing in alarming phase in both developed and developing countries. One reason for the unsuccessfulness of previous health interventions could be the lack of understanding how overweight and obese people consider themselves regarding their weight. Understanding the perception of this particular group of people is important to identify the factors that hinder overweight and obese people for not practicing healthy behaviours, which in turn is helpful to plan appropriate and effective health interventions. Overweight and obese individuals own views can also provide us the best ways in which health interventions can bring about positive outcomes. Although several studies might have been conducted to address the perception of those people regarding their own body, to my knowledge little is known about the previous attempts made to bring these studies together. Furthermore, systematic review studies conducted about specific topic are more powerful in providing better and comprehensive insight from different perspectives compared to studies conducted separately. Therefore, this systematic review is conducted to address the studies focused on the perception of overweight and obese individuals and the associated factors that influence their perception.

1.3. Research Question

In this systematic review the following research questions will be answered:-

- ✓ What is known about the perception of overweight and obese people about their body in relation to their weight status?
- ✓ What is known about the factors that influence the perception of overweight and obese people about their body in relation to their weight?

1.4. Research Objective

The aim of this systematic review is to provide some insight to health promotion intervention planners about this issue from the subjects' point of view. Understanding the problem from the perspective of the target population may help health promoters to have clear idea on which factors should they focus and which factors should be given priority while planning health promotion interventions. Moreover, the outcome of this study might contribute in increasing the awareness of the general public about how overweight and obese people see themselves with regard to their body weight. This in turn might help to reduce the stigma and discrimination of overweight and obese people. This study could also be used as a baseline for other researchers who are interested in this issue.

Chapter 2

2.1. Research Method

This study was a systematic literature review.

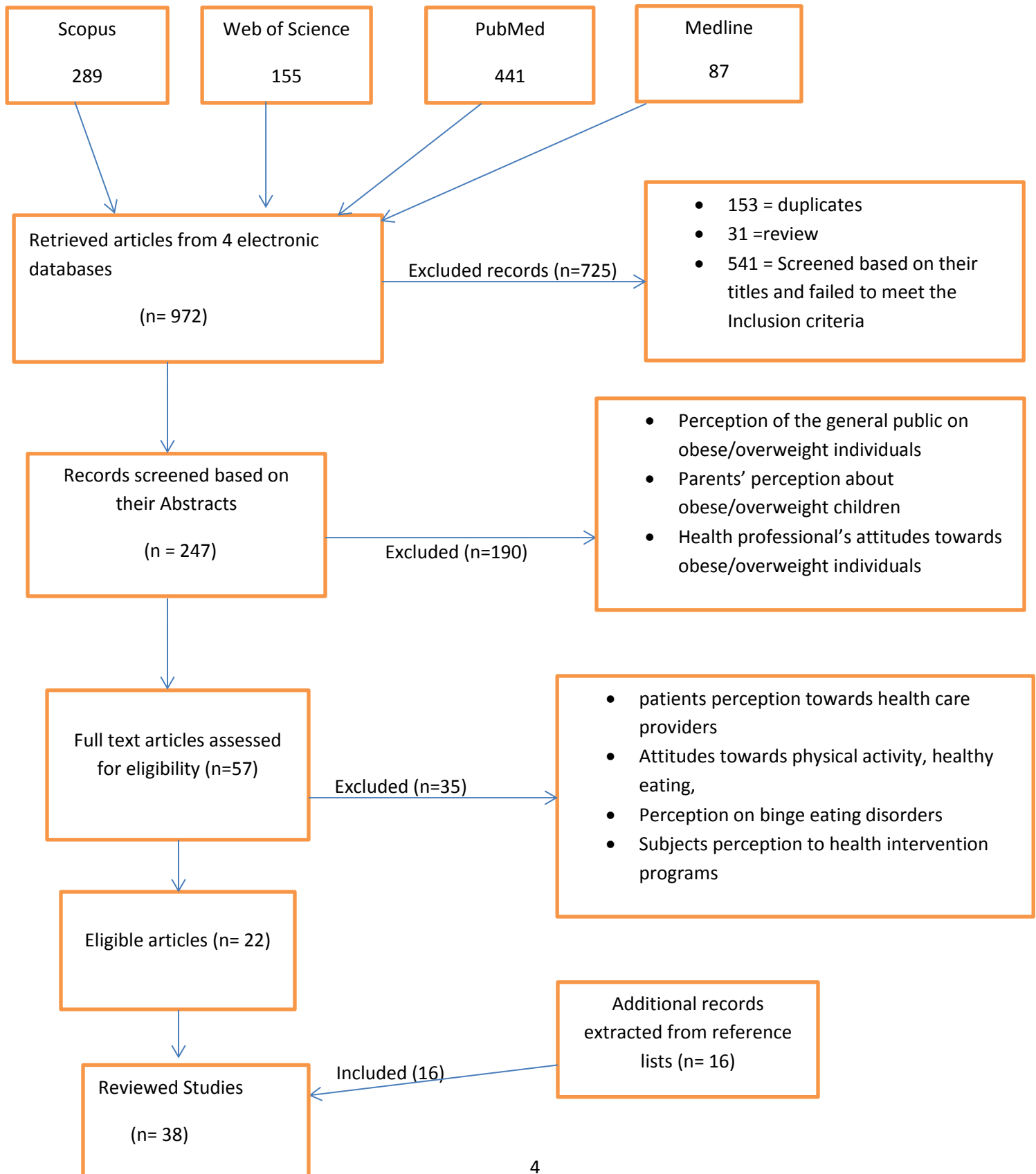
2.2. Search Strategy

A comprehensive literature search was conducted in November and December of 2013, using a range of electronic databases such as Scopus, PubMed, Web of Sciences and Medline. The literature search was limited to studies written in English and original researches. The terms (*Perception* OR belief* OR opinion* OR view* OR attitude* OR perspective* OR notion*) AND (*obes* OR adipos* OR corpulen* OR fat OR overweight OR over-weight OR weight*) AND (*people OR person* OR individual**) AND (*“their body” OR oneself OR self-image*) served as search criteria. In addition, the bibliographies of the selected articles were systematically screened to search other potentially relevant literatures.

Note: - sometimes adjustment was done for the search terms in order to fit with the different electronic data bases if necessary.

Fig.1. describes the flow chart used to select the relevant studies. Initially, 972 articles were retrieved from the four electronic databases. Then their references were imported to EndNote© bibliographic databases followed by deletion of duplicate records electronically and manually, which yields 247 references. 57 articles were then identified after screening the titles and abstracts for likely relevance. However, review of the full text of the 57 articles based on the inclusion criteria resulted in 22 relevant articles. Finally, 38 studies were reviewed including 16 articles extracted from the reference lists of the relevant literatures.

Fig.1. Flow chart used for selecting relevant studies published before January, 2014



2.3. Inclusion and Exclusion Criteria

A Study was included if it: -

- ✓ Addressed the perception of obese and overweight individuals
- ✓ Was written in English
- ✓ Was original research

A Study was excluded if it:-

- ✓ Was a review
- ✓ Was written in other languages than English
- ✓ Addressed the perception of other groups of the society than obese and overweight individuals (such as general public, health professionals, family, peers, etc...)
- ✓ Was about the perception of families/parents on their overweight and obese children

2.4. Assessment of the Quality of Reviewed Studies

The quality assessment of studies included in this systematic review was carried out based on the following criteria adapted from previous studies:-

- ✓ Scope/Purpose – adequate description of the aim of the research
- ✓ Study Design - clear explanation of research methods used
- ✓ Sample - Adequate description of the sample size used, sample recruitment methods, sample selection methods and representativeness of the sample
- ✓ Good response rate (response rate \geq 75% for face-face /telephone interview, \geq 50% for mail questionnaire, \geq 35% internet based questionnaire)
- ✓ Ethics Approval – Adequate information on ethics approval by appropriate body
- ✓ Data collection – Clear explanation of the data collection methods and steps taken to increase rigor in the data collected
- ✓ Data analysis – Adequate and clear description of data analysis methods
- ✓ Reliability and validity - use of evidence based assessment of validity, Clarity of results and conclusions derived based on evidence
- ✓ Generalizability - clear explanation on how and to which extent results/evidences can be generalized beyond the study population and study area
- ✓ Credibility – Are results/evidences credible and to what extent does it give meaningful clarification of the studied subject
- ✓ Significance of the study- research contribution to knowledge and transferability of findings
- ✓ Study limitations and weakness- Adequate and clear description of study limitations and weaknesses

Generally, there were 12 assessment criteria. Thus, based on these criteria included studies were classified as high quality if they satisfied 9 or more criteria, medium quality for studies that satisfied 5 up to 8 criteria and low quality for those studies with less than five assessment criteria.

Chapter 3

3. Results

3.1. Main Characteristics of the Reviewed Studies

The 38 studies included in this systematic review were published between 1989 and 2013 (appendix I). Of these, 22 (57.9%) were conducted in USA, 7 (18.4%) in Europe, 3 (7.9%) in Australia, 3(7.9%) in Asia, 2 (5.3%) in South America and 1(2.6%) in Canada. More than half (65.8%) of the reviewed studies were conducted between 2008 and 2013. The main characteristics of all the studies reviewed are summarized in appendix I.

More than half (71%) of these studies had both male and female respondents, 9 (23.7%) studies had only female subjects and 2(5.3%) studies had only male subjects. Although there was variation of age categories in each study, the age category of all the respondents was 6 years and above. A summary of the age categories of respondents of the reviewed studies is shown in table 1 below and its detailed description is shown in appendix II. Out of all, 25 of the studies were cross-sectional studies, 7 were qualitative studies, and 4 were survey, 1 exploratory and 1 randomized control trial experimental study. Self- reported questionnaire and in-depth interview were the most commonly used data collection methods. Almost all studies reported the criteria used to classify overweight or obesity based on body mass Index (BMI). BMI is a person's weight in kilograms divided by the square of height in metres (kg/m^2). Of these 38 studies, 27 studies used measured height and weight to calculate BMI, 10 studies used self-reported height and weight and 1 study used both self-reported and measured height and weight. The sample size of the studies varies from 24 in qualitative interview to 17270 in National Health and Nutrition Examination Survey (NHANES). Response rate was only reported in 10 studies.

Although the main focus of the reviewed studies was weight perception, some studies had also addressed perception of weight related health risks, body satisfaction, attempting/trying to lose weight and dieting combined with weight perception. Out of all, 27 studies were mainly focused on the perception of weight, 4 studies perception of weight and perception of health risks, 3 studies addressed the perception of weight and body satisfaction, 3 studies the perception of weight and attempting/trying to lose weight and 1 study on perception of weight and dieting practices.

Table.1. Summaries of Age Categories of Respondents of the Reviewed Studies

Age Categories	Number of Studies	Percentage (%)
6-18	7	18.4%
14-20	1	2.6%
≥15	1	2.6%
≥18	16	42.1%
19-75	8	21.1%
24-32	1	2.6%
32-83	1	2.6%
45-70	2	5.3%
≥40	1	2.6%
Total	38	100%

3.2. BMI Categories of Respondents of the Reviewed Studies

Table 2 shows the summaries of the range of BMI categories of the respondents of the reviewed studies. Respondents BMI categories ranges from underweight to obese. 10 studies had respondents with BMI categories between normal weight and obese, 6 had overweight and obese respondents, 5 studies had only obese respondents, in 4 studies respondents BMI ranges from underweight to obese, 3 studies had only overweight, 3 studies had either overweight or obese respondents, 2 studies had underweight to overweight respondents, 2 studies had normal weight and overweight/obese respondents and 1 study had normal weight and overweight respondents. The detailed description of percentage of BMI categories of the respondents in each study is shown in appendix III.

Table.2. Summaries of BMI Categories of Respondents of the Reviewed Studies

BMI categories	Number of studies	Percentage (%)
Underweight – obese	4	10.5%
Underweight – overweight	2	5.3%
Normal weight –obese	10	26.3%
Normal weight and overweight	1	2.6%
Normal weight and obese	2	5.3%
Normal weight and overweight/obese	2	5.3%
Overweight and obese	6	15.7%
Overweight	3	7.9%
Obese	5	13.2%
Overweight/obese	3	7.9%
Total	38	100%

3.3. Quality of the Reviewed Studies

The quality of the studies reviewed was assessed based on the 12 assessment criteria presented above. Thus, 14 studies were perceived to be high quality, 19 studies of medium quality and 5 studies were considered to be of low quality. Nearly all studies had clearly defined study aim, clear explanation of research methods, adequate description of data collection and analysis methods, suitable study populations and appropriate descriptions of the study limitations and weaknesses. Moreover, majority of the studies had used evidence based clarification for their results and had transferable findings. However, majority of the studies were not representative and did not had sound sample selection methods. Furthermore, the response rate was only reported in 10 studies, which was good in 9 of them. Most studies did not also report steps taken to increase rigor of the data collected.

3.4. Perception of weight by BMI

Weight misperception was reported almost in all studies either as underestimation of weight or overestimation of weight. Underestimation of weight was reported in normal weight, overweight and obese respondents, while overestimation of weight was reported in underweight, normal weight and overweight respondents. The percentage of weight misperception across all BMI groups is summarized in

table 3 below, which represents only those studies that reported the overall misperception. As it is shown in this table, the percentage of weight misperception varies across BMI categories, in which highest rate was reported in obese and overweight respondents. Moreover, obese respondents were more likely to underestimate their weight than overweight respondents.

Table.3. Misperception of weight by BMI

Underweight	Normal weight	Overweight	obese	Overweight/obese	References
29.7%	18.8%	29.3%	8%	23%	50, 30, 31, 54
	18.9%	30.6%	12.7%	26.9%	28, 30, 55
		30.7%	50.9%	28.4%	26, 28, 30
		31.2%	65.4%		30, 54
		32.8%	73%		30, 36
		33.4%	75%		27, 54
		46%	87%		36, 53
		60%			53

3.4.1. Overestimation of Weight by BMI and Gender

Normal weight respondents were more likely to overestimate their weight than overweight and underweight respondents. Table 4 below shows the percentage of respondents who overestimate their weight. In addition, female respondents were more likely to overestimate their weight than male respondents in all BMI categories.

Table.4. Overestimation of weight by BMI and Gender

Underweight		Normal weight		Overweight		References
Male	Female	Male	Female	Male	Female	
				2%	7%	24
		12.5%	33.3%			38
			38.3%			48
		22.7%	55.2%			49
		21.4%	46.4%			51
		10.9%	35.3%			52
		18%				53
29.7%		18.8%				54

3.4.2. Underestimation of Weight by BMI and Gender

All the reviewed studies reported that there was underestimation of weight in all BMI groups except in underweight respondents. The percentage of underestimation of weight by BMI and gender is shown in Appendix IV. Appendix IV also shows the references of the reviewed studies which reported that underestimation. In all studies, overweight and obese respondents were more likely to underestimate their weight than normal weight respondents. Moreover, obese and male respondents were more likely to underestimate their weight than overweight and female respondents respectively.

3.5. Factors that Influence Perception of Weight

All the reviewed studies have revealed that there were many factors that influenced the perception of weight among their respondents. In this review the factors that influenced the perception of being overweight and obese are categorized as demographic factors, socio-cultural-cognitive factors and health related factors. Demographic factors includes, gender, race/ethnicity, educational level, age, income level, socio-economic status, geographical/area of residence marital status and number of births. Socio-cultural-cognitive factors were social-cultural norms, lifestyle, knowledge of ideal body weight, social stigma and stereotypes about overweight/obesity, body size satisfaction, prevalence of overweight/obesity, environmental factors, family history/heredity and stylish cloth sizes. And self-rated health status, health status (presence/absence of chronic diseases) and weight related health risk perception were reported as health related factors. Table 6, 7 and 8, shows the detailed description of the factors and their influence on weight perception and the references of the studies who reported each factor. Here the factors are presented based on the extent to which they have been addressed. The summaries of all the factors and the number of studies which reported each factor is also presented in table 9.

3.5.1 Demographic Factors

Gender

There was significant difference in weight misperception among male and female respondents. All studies reported that men were more likely to underestimate their weight than women and women were more likely to overestimate their weight status than men across all BMI groups. In addition, girls were more likely to dislike the way they look, to desire to be thinner and to have more weight concerns than boys. On the other hand boys had higher scores for physical appearance and athletic competence than girls.

Race/Ethnicity

Race/ethnicity had a greater role in perception of weight, perception of weight related health risks and body satisfaction. Black and Hispanic respondents were more likely to underestimate their weight than white, Mexican-Americans and other racial/groups. Non-Hispanic whites were more likely to perceive themselves as being overweight/obese than non-Hispanic blacks and Mexican-American respondents. Furthermore, overweight/obese non-Hispanic blacks and respondents from other race/ethnicity were more likely to disagree that their weight was a risk for health than non-Hispanic white respondents. Although body dissatisfaction was reported in both black and white girls, white girls were more likely to be dissatisfied with their body size and were more likely to prefer smaller body size than black girls.

Educational level

Respondents in the lower educational level were more likely to underestimate their weight than those with higher educational level, with the exception of one study which reported that more males with higher educational level underestimate their weight than those with lower educational level [24]. In addition, higher educational level was associated with higher body dissatisfaction and selection of

slimmer body size in females. Moreover, overweight/obese women in the lower educational level were more likely to disagree that their weight was a risk for health. It was also found out that normal weight respondents with lower educational level were more likely to overestimate their weight than normal weight respondents with higher educational level.

Age

Overweight/obese respondents in older age (≥ 50 years) were more likely to perceive their actual weight correctly and less likely to underestimate their weight, except in one study which was reported that weight underestimation was more common in respondents with older age (≥ 65 years) [52]. Overweight/obese women in the younger age groups were more likely to describe themselves as ugly and fat and to feel unattractive than older women. Moreover, the degree of the way they look, wanting to be thinner and to have lower scores in physical appearance and attributes was associated with increasing age in children in the age group from 9-12 years [43].

Income level

Respondents with higher income level were more likely to perceive their weight status correctly than those with lower income level. Overweight/obese respondents with higher income level were also less likely to underestimate their weight. Furthermore, overweight/obese women with lower income level were more likely to disagree that their weight is a risk for health than those with higher income level.

Socio-economic status

Overweight/obese respondents with higher socio-economic status were more likely to perceive themselves as being overweight /obese than respondents with lower socio-economic status. Higher socio-economic status was also associated with selection of slimmer body size in girls and with higher score for social-acceptance, self-perception of social acceptance and physical appearance in children.

Geographical/area of residence

Obese respondents living in Australia but who were born in western/eastern Europe were more likely to underestimate their weight than those who were born in Australia. Overweight/obese respondents who live in less populated area and those from rural areas were also more often to underestimate their weight than those who live in high populated and urban areas. In addition, respondents who were living in the Mediterranean countries were more likely to underestimate their weight than those who were living in Scandinavian countries.

Marital status and Number of Births

Marital status and number of births were also reported as demographic factors that influenced weight perception of men and women, respectively. Overweight/obese men who have never been married were less likely to perceive themselves as being overweight/obese than married men. In women, those who never gave birth and those who gave more than 3 births were more likely to underestimate their weight than females who gave 1, 2 or 3 births.

Table.6. Demographic factors that influence weight perception

Demographic factors	Influence on Perception		References
	Male	Female	
Gender	Male respondents were more likely to underestimate their weight than females across all BMI categories Boys were more likely satisfied with their physical appearance and feel more competent in physical activity than girls	Female respondents were more likely to overestimate their weight than male respondents across all BMI categories Girls were more likely to desire to be thinner, not liking the way they look and had lower scores for global self-concept, physical appearance and attributes than boys Normal weight girls reported more weight concerns than normal weight boys	24, 26, 27, 28, 30, 31, 34, 36, 38, 43, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 60
Race/Ethnicity	White respondents were more likely to report that they are overweight than black respondents African-American and Hispanic participants were more likely to underestimate their weight than White Americans Non-Hispanic whites were more likely to perceive themselves as overweight/obese than non-Hispanic blacks and Mexican-American respondents Black American respondents were more likely to underestimate their weight than Mexican Americans Overweight/obese non-Hispanic blacks and respondents from other race/ethnicity were more likely to disagree that their weight was a risk for health than non-Hispanic white respondents Hispanic and non-Hispanic black normal/underweight respondents were less likely to overestimate their weight than normal/underweight white respondents		25, 27, 30, 31, 33, 42, 45, 47, 48, 50, 51, 52, 53, 56, 60
	Black men were less likely to report that they were overweight compared to white and Hispanic	Black respondents prefer larger body size than white Hispanic female respondents who take lower total energy were more likely to misperceive their weight than those who take higher energy Black females were more likely to underestimate their weight and to feel more attractive than white females respondents White females had lower self-perception of body size attractiveness than black respondents Overweight/obese African-American respondents were more likely to had positive aspects of their bodies than the Caucasian girls Women who were non-Hispanic black, American Indian/Alaskan Native, or Hispanic women were more likely to express satisfaction with their body size compared with non-Hispanic white women	
Educational level	Respondent with lower educational level were more likely to underestimate their weight than those with higher educational level Respondents from lower level of education were less likely to be aware of being overweight/obese Than respondents in the higher education level Normal weight respondents with lower educational level were more likely to overestimate their weight than those with higher educational level		24, 28, 29, 44, 45, 46, 48, 50, 51, 52, 53, 56

	More men respondents with higher educational level underestimate their weight than those with lower educational level	Female respondents with higher educational level had higher body dissatisfaction than those with lower educational level Female respondents with higher educational level were more likely to select slimmer ideal body shape than those with lower educational level Women with lower educational level were less likely to describe themselves as being overweight/obese and more likely to disagree that their weight is a risk for health than those women with higher educational level	
Age	<p>Older respondents (age ≥ 50 years) were less likely to underestimate their weight than those younger than 50 years of age</p> <p>Respondent with ≥ 40 years were less likely to misperceive their weight as being overweight than those less than 40 years</p> <p>Children with 12 years of age were more likely to dislike the way they looked and to desire to be smaller in body size and to have lower scores for physical appearance and attributes than children with the age of (9- 11 years).</p> <p>Younger and middle age respondents were more likely to perceive themselves as overweight/obese than those in the older age group(≥ 55 years)</p> <p>Younger overweight/obese women were more likely to describe themselves negatively as ugly, unattractive, huge than older women</p>		24, 27, 28, 36, 43, 44, 45, 46, 48, 52, 57
	Men respondents between the ages of 35 and 64 years were more likely to overestimate their weight than men in the other age groups	Women respondents in the age group(40-69) were more likely to express body satisfaction compared with those greater than 70 years of age Women in the age group (40-65) were less likely to describe themselves as too fat or obese Women with <65 years of age were more likely to overestimate their weight than women >65 years	
Income level	<p>Respondents with higher income level were more likely to perceive their weight correctly than those with lower income level</p> <p>Overweight/obese respondents with higher income level were less likely to underestimate their weight than those with lower income level</p> <p>Normal weight respondents with higher income level were more likely to overestimate their weight status than those who had lower income level</p>		48, 51, 52, 53, 54, 56
		Women respondents with higher income level were more likely to perceive themselves as being overweight/obese than women with lower income level Overweight/obese women with lower annual household income were more likely to disagree that their weight is a risk for health than those with higher income level	

Socio-economic status	Obese/overweight children respondents from poor socio-economic status had lower social-acceptance score and lower self-perception of social acceptance and physical appearance than those from higher socio economic status Exposure to disadvantaged socio-economic status was associated with lowered self-esteem in some overweight/obese children Respondents from lower socioeconomic status were more likely to be unaware of being overweight than those with higher socio-economic status		29, 34, 44, 54
		Higher socio-economic status was associated with selection of slimmer ideal body shape in female respondents	
Geographical/ Area of residence	Respondents who live in the Mediterranean region were more likely to underestimate their weight than those who live in Scandinavian countries Overweight/obese respondents who live in less populated areas were more likely to misperceive their weight than those who live in more populated areas Respondent from rural areas were more often misperceive their weight status than those who live in Urban areas Obese respondents who were born in eastern or western Europe were more likely to misperceive their weight as being obese than those who were born in Australia		24, 28, 54
Marital status	Men who have never been married were less likely to perceive themselves as overweight/obese than married men		48
Number of births		Females who never gave birth and those who gave more than 3 births were more likely to misperceive their weight than females who gave 1, 2 or 3 births	44

3.5.2. Socio-Cultural-Cognitive Factors

Socio-cultural norms

Some African-Americans and Asian overweight/obese respondents perceived that their cultural and traditional way of feeding and giving priority to care their family than themselves were the causes of their weight gain. Besides, African-Americans female respondents were more satisfied with their weight and feel more attractive with their body than American white females, although they have larger body size than the whites. On the other hand, white female respondents were more likely to be dissatisfied and feel less attractive with their body than black females.

Lifestyle

Smoking, physical activity and receiving food stamp were reported as lifestyle factors that affected perception of weight status. In general, overweight and obese respondents with frequent physical activity and those who reported they were in the maintenance stage of physical activity were more likely to underestimate their weight than respondent with sedentary way of life, except in females, in which more underestimation of weight was reported in those who had no-frequent physical activity [24]. In men, current smokers were more likely to underestimate their weight than ex-smokers and non-smokers were

more likely to be unaware of being overweight and obese. In females, non- smokers were more often tended to underestimate their weight than smokers.

Social Stigma and stereotypes about obesity

Some overweight and obese respondents used the stereotypical words to describe themselves and had negative attitudes towards their body. Besides, some obese respondents did not like to use the word obesity to definite themselves and were more trying to distant themselves from obesity and from people who were more obese than themselves. Inaddition, trying to be perfect in other aspects of their life and developing the fat-acceptance were reported by some overweight and obese respondents as a way of minimizing weight related social stigma.

Knowledge of ideal body weight

Lack of knowledge for ideal body weight was associated with underestimation of weight status, body satisfaction and with having less intention to lose weight in overweight and obese respondents.

Body Satisfaction

Overweight and obese respondents who were satisfied with their body were more likely to underestimate their weight status than those who were dissatisfied. Moreover, body satisfaction was associated with excellent/very good self-rated health status in overweight and obese women respondents.

Environmental

Some overweight and obese respondents believed that lack of access for physical activity was the cause of their weight gain.

Prevalence of overweight/obesity their area

Overweight and obese respondents who had more overweight and obese people in their surrounding were more likely to consider their weight as normal as and more likely to underestimate their weight than those who live with less overweight and obese people.

Family history and Heredity

Overweight and obese respondents who had overweight/obese family members perceived that their weight gain was as a result of family history and heredity. Besides, they were more likely to consider their weight to be normal than respondents without overweight/obese family history.

Stylish clothe sizes

Difficulty to find stylish clothe sizes was associated with self-perception of ugliness and body dislike in overweight and obese respondents as they wanted to be good looking by wearing those clothes, especially females.

Table.7. Socio-Cultural-Cognitive factors

Cultural-Socio-cognitive factors	Influence on Perception		References
	Male	Female	
Socio-cultural norms	<p>African-American female respondents believed that socio-cultural influence on food choices and traditional eating habits, like too sweet and high fat meals and prioritizing family caring than their own body were the main causes of their weight gain</p> <p>Socio-cultural standards that associated larger body size with good health and wealth was associated with misperception of being overweight/obese and weight related health risks in black Americans and Asian female respondents</p> <p>Overweight and obese white female respondents feel shameful about their large body size because of their cultural norms that value slimmer body size</p> <p>Cultural pressure to be self-accepting believing that weight is God giving had negative influence on perception of being overweight/obese in African-American female respondents</p> <p>American-African girls reported that they value character above appearance</p>		35, 36, 40, 57
	Some men respondents believed that their weight gain was as result of focusing on social expectation to care their family and they associated being overweight with masculine characteristics of strength and power		
Lifestyle	<p>Respondents with sedentary way of life were more likely to underestimate their weight than those with more active way of life except for men in 1995/ 1997</p> <p>Respondent who were in the maintenance stage of physical activity were more often tended to wrongly select their actual body image than those who were not</p> <p>Respondents who had more active lifestyles were more likely to misperceive their weight as being overweight/obese</p> <p>Normal/underweight smokers were less likely to overestimate their status weight than normal/underweight non smokers</p> <p>Overweight Food Stamp recipients respondents were more likely to underestimate their weight than overweight food stamp non-recipients</p> <p>Normal/underweight food stamp recipients were less likely to overestimate their weight than normal/underweight food stamp non-recipients respondents</p> <p>Both obese and severely obese respondents blame themselves for their weight gain</p>		23, 24, 44, 52
	<p>Current smoker respondents were more likely to underestimate their weight than ex-smokers</p> <p>Men respondents who reported frequent physical activity were more likely to underestimate their weight than those with no frequent physical activity</p> <p>Non-smokers tended to be unaware of being overweight more likely than ex-smokers and current smokers</p>	<p>Non-smokers tended more often to underestimate their weight than smokers</p> <p>Women respondents who reported no frequent physical activity were more likely to underestimate their weight than those who reported frequent physical activity</p> <p>Women with active way of life were more likely to underestimate their weight than those with sedentary way of life (36.2% vs 28.9%)</p> <p>More women blame themselves for their weight gain and reported that they were aware of being overweight than men respondents</p>	

Social Stigma and social stereotypes about obesity	Obese respondents do not want to use the stereotypical words used to describe obese people to define their weight status and tried to distant themselves from obesity and from people fatter than themselves Severely obese respondents internalized stereotypical messages about obesity and often used negative words to describe their body Trying to be perfect in other parts of their appearance and development of fat acceptance was reported by overweight/obese respondents as way of minimizing their weight related stigma and social isolation Majority of overweight/obese respondents had negative attitudes towards overweight/obesity linked to self-stigmatization	23, 39, 57
Knowledge of Ideal body weight	Not knowing the ideal body weight was associated with being more content with their current weight and having lower intention to lose weight among overweight/obese respondents Lack of knowledge of the cut point for BMI categories had positive effect on respondents misclassification of their weight status	36, 37, 38
Body Satisfaction	Overweight/obese respondents who were satisfied and happy with their body were more likely to underestimate their weight than those who were dissatisfied Overweight/obese women respondents who rated their health as excellent/very good were more likely to express body satisfaction than those who rated fair/poor	36, 45,
Environmental	Lack of accesses for physical activities were reported as contributors to weight gain by some respondents Obese respondents believe that environmental factors were the cause of their weight gain	23, 40
Prevalence of overweight/obesity their area	Presence of more overweight/obese people in their surrounding had negative influence on overweight/obese respondents perception about their own weight as they compare themselves with people around them and their peer groups and considered their weight as normal Respondents believe that being overweight/obese was associated with family history of overweight/obesity if they have more overweight/obese people in their family	39, 41
Family history/ Heredity	Obese respondents believe that family heredity was the main cause for their weight gain Family history was reported as an attributes for weight gain by overweight and obese respondents	40, 59
Stylish clothe sizes	Difficulty to find stylish clothes sizes was associated positively with self-perception of ugliness and body dislike in overweight/obese respondents as they wanted to be good looking especially female respondents	39, 40

3.5.3. Health Related Factors

Self-rated health status

Overweight and obese individuals who rated their health as excellent/very good were more likely to underestimate their weight than those who rated good, fair/poor. Furthermore, self-rating health status as fair/poor was associated with body dissatisfaction in overweight and obese female respondents.

Health status

Overweight and obese respondents with chronic diseases were more likely to underestimate their weight as being overweight/obese than those without chronic diseases. Besides, the presence of chronic diseases in both normal weight and overweight respondents influenced the perception of overweight people not to believe that their weight is a risk for health.

Weight related health risk perception

Overweight and obese respondents who underestimate their weight and who had no any health problems were more likely to misperceive that their weight is a risk for health. But respondents with prevalent chronic diseases were less likely to disagree/misperceive their weight is a risk for health. Among men and women, overweight and obese women were more likely to agree that their excess weight is a risk for health than overweight and obese men. Furthermore, obese women were more likely to report that they have higher susceptibility of weight related health risks than normal and overweight women respondents.

Table.8. Health related Factors

Health related factors	Influence on Perception		References
	Male	Female	
Self-rated health status	Overweight/obese respondents who rated their health status as good, fair/poor were more likely to perceive themselves as overweight/obese than who rated their health as excellent/very good		27, 45, 51, 56, 58
		Overweight/obese women who rate their health as fair/poor were more likely to express body dissatisfaction than those who rated their health as excellent/very good	
Health status	Respondent who had chronic diseases misperceived their weight status than those without chronic diseases Presence of comorbid diseases in both overweight and normal weight people negatively affected overweight respondents not to perceive that their weight is a risk for health If respondents were overweight/obese but relatively healthy, they were more likely to underestimate their weight category and not to believe weight related health risks		36, 44, 41, 56
	Small proportion of hypertensive men were unaware of being overweight compared with men without hypertension		
Weight related health risk perception	If respondents were overweight/obese but relatively healthy, they were more likely to misperceive their weight could be a risk for health Overweight/obese respondents with prevalent chronic conditions were less likely to disagree that excess weight is a health risk Overweight/obese respondents who underestimated their weight were more likely to misperceive the health risks of excess weight than those who correctly know their weight status and those who overestimate their weight		37, 51, 56
	Overweight/obese men respondents were more likely to disagree that their excess weight is a risk for health than overweight/obese women	Obese women were more likely to report that they have a higher susceptibility of weight related diseases than normal weight women	

Table 9 shows the summaries of all the factors which influenced weight perception and the number of studies reported each factor.

Table.9.Summaries of the factors that influence weight perception

Demographic factors		Socio-cultural-cognitive factors		Health related factors	
	Number of studies		Number of studies		Number of studies
Gender	22	Socio-cultural norms	4	Self-rated health status	5
Race/ethnicity	15	Lifestyle	4	Health status	4
Educational level	12	Social Stigma and social stereotypes about obesity	3	Weight related health risk perception	3
Age	11	Knowledge of Ideal body weight	3		
Income level	6	Body Satisfaction	2		
Socio-economic status	4	Environmental	2		
Geographical/Area of residence	3	Prevalence of overweight/obesity their area	2		
Marital status	1	Family history/ Heredity	2		
Number of births	1	Stylish clothe sizes	2		

3.6. Factors that Influence Weight lose attempt/trying to lose weight

In addition to the results presented above, factors that influence overweight and obese respondents to attempt/try to lose weight were also reported in some of the reviewed studies. These factors includes, perception of being overweight/obese, gender, age, fearing of weight related health risks, body dissatisfaction, health problem and functional status, lack of knowhow and difficulty to resist eating, failed weight lose attempt, BMI, not finding stylish clothe sizes and social stigma. Table 10 below shows the detailed description of these factors and their influence on overweight and obese respondents to attempt/try to lose weight.

Table.10. Factors that influence weight loss attempt and trying to lose weight

Factors	Male	Female	References
Perception of being overweight/obese	<p>Respondents who perceived their weight status as being overweight/obese were more likely trying to lose their weight than those who underestimate their weight</p> <p>Overweight/obese respondents who correctly perceived their weight were more likely attempted to lose weight than those who underestimate their weight status</p> <p>Obese respondents who believed that they were obese were more likely to report they want to lose weight than those who believed they were overweight and normal weight</p>		30, 31, 41, 46
		Women respondents who underestimate their weight status were less likely to meet activity recommendations than those who correctly perceive their weight category	
Gender	Obese men respondents were more likely to attempt weight control than obese women	Women tended to have strong histories of weight loss and attempting to lose weight than men	46, 49, 56
Age	Weight loss attempt was associated with increasing age in men	Women in the age of 40-69 were more likely trying to lose weight than women ≥ 70 years of age	45, 46
Fearing of weight related health risks	Respondents who agree that their weight is a risk for health were more likely to report trying to lose weight than those who disagreed their weight is a risk for health		40, 56
Body dissatisfaction		<p>Women respondents who were not happy and who feel unattractive with their body size reported that they want to lose weight</p> <p>Women who were dissatisfied with their body were nine times more likely to report trying to lose weight than women who were very satisfied</p>	40, 45
Health Problem and Functional status	Overweight/obese men respondents with one weight related health risk factor were less likely to participate in sport activity in their spare time than those who had more than one risk factors	Perceived health problems and functional status were reported as the main factors wanting to lose weight among obese women respondents	35, 46
Lack of knowhow and difficulty to resist eating	Overweight/obese respondents reported that lack of knowledge how to lose weight and difficulty to reduce eating were the main factors that discourage them not to try to lose weight		39
Failed weight loss attempt	Failed weight loss attempt was reported by overweight/obese people as main reason that hindered them to lose weight		39
BMI		<p>Obese women respondents were less likely to participate in sport activity during their leisure time than normal weight women (21% vs. 52%)</p> <p>Overweight women had more stronger histories of weight loss attempts and were more likely trying to lose weight than normal weight women</p>	46
Stylish clothes sizes		Not finding stylish clothes sizes was reported as one of the factors that encouraged women respondents to lose their weight	40
Social stigma	Obese adolescent respondents were trying to lose weight in order to defend themselves from the social stigma and being self-blamed		59

Chapter 4

4.1. Discussion

This study was aimed at reviewing the perception of overweight and obese people about their own body and the factors that influence their perception. In this review, 38 studies conducted in different countries were included. Although the main aim of all the reviewed studies was to address the perception of overweight and obese respondents, majority of the studies had also respondents from all BMI categories. Based on the 12 quality assessment criteria conducted in this review, 14 studies were perceived to be high quality, 19 studies of medium quality and 5 studies were considered to be of low quality. It seems that more than half (63.2%) of the studies were of medium and low quality. Almost all the reviewed studies had clearly stated research objective, well described sample requirement methods, clear explanation of data collection and analysis methods and suitable report of their limitations and shortcomings. However, majority of them were not representative. Thus, the question of representativeness might influence the generalizability of the findings. Most studies did not also report about any steps taken to increase the rigor of the data, which might have influenced the validity of the data.

Self-reported questionnaire and in-depth interview were the most widely used data collection methods. But since perception is a subjective feeling which cannot be easily measured, it would have been better to use in-depth interviews to explore the respondents feeling more deeply. Although self-reported questionnaire can answer the raised issue but it does not give a chance to the researcher to understand the feeling of the respondent deeply. In -depth interview gives more space for the research to be more flexible in exploring the issue in question. Besides, some ideas could be generated from the facial expression of the respondents during the interview. Therefore, further research with in-depth interview should be conducted to explore the perception of overweight and obese people in relation to their body.

Weight Perception by BMI

Weight misperception was reported almost in all the reviewed studies. Almost all studies found out that many overweight and obese respondents do not perceive themselves as being overweight and obese, which actually underestimated their weight. The percentage of weight underestimation among obese respondents ranges between 8%-87% and from 29%-60% among overweight respondents (table 3). This shows that a large proportion of overweight and obese people do not actually perceive they were overweight or obese. Moreover, obese respondents were more likely to underestimate their weight than overweight respondents. The inclusion of respondents from all BMI groups had also significant effect in revealing that overweight and obese respondents were more likely to misperceive their weight than normal weight and underweight respondents. Moreover, it clearly showed that there was variation of weight perception across all BMI categories. Several studies have proven that the perception of being overweight and obese along with awareness of weight related health risks is strongly associated with practicing healthy behaviors [12-18]. This suggests that it is less likely that overweight and obese respondents who underestimate their weight will display healthy behaviors. Therefore, much more attention should be given in raising awareness of weight status before planning weight reduction interventions. Some of the reviewed studies also reported that overweight and obese respondents

misperceived their weight but did not clearly specify whether they actually underestimated or overestimated their weight status. Thus further research is needed to clearly identify either those group of people underestimate or overestimate their weight.

This review also revealed that a significant proportion of normal weight respondents overestimate their weight status (table 4). For instances, in one study 55.2% of normal weight female respondents and 22.7% normal weight male respondents perceived that they were overweight [49]. Underweight or normal weight adolescents who believed that they are overweight are at higher risk of developing eating disorders and anorexia nervosa [61]. This suggests that weight status awareness campaigns should address not only overweight and obese people, but also people in all BMI categories with different messages. This is because weight related health risks that affect people who underestimate their weight are different than weight related health risks that affect people who overestimate their weight.

Factors that influence weight perception

In this review, it was revealed that there were many factors that played a significant role in influencing weight perception. Those factors are presented in three categories as demographic, socio-cultural-cognitive and health related factors. Among those factors, demographic factors were most represented factors. It seems that most studies put much more emphasis on the demographic factors than on the socio-cultural-cognitive and health related factors. For example, gender was addressed in 22 of the 38 reviewed studies, race/ethnicity in 15 studies, educational level in 12 studies and age in 11 studies. While socio-cultural-cognitive and health related factors were studied only in few studies, in which highest was 4 studies for socio-cultural norms and 5 studies for self-rated health status. Although, the influence of the socio-cognitive and health related factors was given less attention in the reviewed studies, these factors might have stronger influence on weight perception than the demographic factors. It is also understood that demographic factors are more easily measurable factors than the subjective nature of the other factors. Moreover, all the reviewed studies were trying to look at the influence of each factor on weight perception independently. It seems that the interrelationship of these factors and their influence on weight perception has not been studied. Further research, therefore, is needed to explore the strength of the relationship between these factors and weight perception.

In this study all factors are discussed in sequential order based on the extent to which they were represented.

Demographic factors

Gender, race/ethnicity, educational level, age, income level, socio-economic status, geographical area, marital status and number of births were the demographic factors studied as influential factors in the reviewed studies.

Gender was reported as an influential factor for weight perception in 22 of the reviewed studies. Our review demonstrated that independently of BMI categories, female respondents were more likely to overestimate their weight, more often desired to be thin, to be more dissatisfied with the way they look and to have more weight concerns than male respondents. On the other hand, male respondents were

more likely to underestimate their weight, to be more satisfied with the way they look and to have more self-confidence in their physical competence than females. It seems that women were more likely to perceive their bodies in terms of cultural ideal body and cosmetics, while men tended to view in terms of muscular strength and ability to take care of the family. The difference in weight perception between men and women could be due to the socio-cultural norms that value slimmer ideal body for women, which put much more pressure on them to be more concerned about their beauty. Thus, it is more likely that women will display more body concern than men. Further research is therefore, needed to explore how cultural norms and weight perception are associated in relation to gender.

Analysis across different racial/ethnic groups used in the reviewed studies which were conducted in North America revealed that there was significant difference in weight perception. Independently of BMI category and gender, black respondents were more likely to underestimate their weight status than white, Hispanic and other racial/ethnic groups. And white respondents were more likely to overestimate their weight status than black, Hispanic and other racial/ethnic groups. Moreover, overweight and obese non-Hispanic blacks and respondents from other racial/ethnic groups were more likely to disagree that their excess weight is a risk for health than non-Hispanic whites. Among female respondents, black respondents were more likely to underestimate their weight, to prefer larger body size and to be more satisfied with their body. Black female respondents were also more likely to feel attractive with their body than white females although they had larger body size than the whites. Additionally, it has been shown that overweight and obese American-African female respondents were more likely to have positive aspects of their body than Caucasian girls. Thus, racial/ethnic differences revealed that BMI and perceived attractiveness were negatively associated for white women, but no association was found for black women. This could be due to the fact that body satisfaction and attractiveness is more related to the subjective feeling of an individual than to physical appearance.

The difference in weight perception and attractiveness among various racial/ethnic groups could be due to the diverse cultural norms that give value to body image differently. A literature review of body images and obesity risk among black females, suggested that thinness is associated with poor health and poor standard of living, while larger body size is associated with good health and gorgeousness [62]. Moreover, some studies have shown that white women were more likely to idealize slimmer body image which is shown in the social media than black women, which contributed to lower motivation for thinness in black Americans and more body dissatisfaction in white female[63, 64]. Besides, it has been suggested that African Americans who were highly oriented to their cultural values were more likely to be satisfied with their body than those who give less value to their own cultural orientation [65]. Thus, it is more likely that African American values will encourage black females to have more body satisfaction as they are more likely oriented to it than the white. Moreover, having more body satisfaction and attractiveness in black women could be associated with self-evaluation of beauty in many terms such as valuing character above appearance, wearing stylish cloths, hairstyles and other cosmetics.

With respect to educational level, it was found out that respondents with lower educational level were more likely to underestimate their weight and more to misperceive their weight as being overweight/obese than those with higher educational level, with the exception of one study which reported that more males with higher educational level underestimate their weight than those with lower

educational level [24]. In addition, females with higher educational level were more likely to select slimmer ideal body and to be more dissatisfied with their body weight than those with lower educational level. One explanation for this difference might be respondents with higher educational level are more likely to be exposed with people from different cultural values that perceive body image differently such as in universities and work settings than those with lower educational level. Thus, this might have increased their awareness to ideal weight status. They might also have more access for physical activities than those with lower educational level, either because they are from higher income level or they had adequate accessibility for physical activity at their universities/work settings. Furthermore, women with higher educational level might be more likely to have the desire to choose their partner with higher education and higher economic level commensurate with their level. Thus, this might have influenced them to be more concerned about their beauty and ideal body weight. It could also be due to the social pressure put for females to maintain their body image in accordance with accepted slimmer ideal body portrayed in social media, which might be more accessible for higher educated women.

This study also revealed that overweight/obese respondents in older age (≥ 50 years) were more likely to perceive their weight status correctly and less likely to underestimate their weight, except in one study in which more respondents with older age (≥ 65 years) underestimate their weight [24]. This review also found out that both younger and middle age respondents were more likely to overestimate their weight status than older age groups. Correctly perceiving weight status in older people could be due to the fact that older people are less likely concerned in their beauty than younger people. It might also be due to the higher prevalence of chronic diseases in older ages that might contribute in increasing their awareness to weight related health risks. Thus, further research is needed to explore the relationship of weight perception and age.

Income level and socio-economic status were also reported as influential factors for weight perception in 6 and 4 of the reviewed studies respectively. These studies showed that respondents with higher income level and higher socio-economic status were less likely to underestimate their weight and more likely to correctly perceive their weight status than those in the lower level. It was also found out that women with higher income level and higher socio-economic status were more likely to select slimmer ideal body and more likely to agree that weight is a risk for health than women with lower income level and lower socio-economic status. This could be due to the fact that people with higher income level and socio-economic status have more access for different types of foods, social media, physical activity facilities and cosmetics. They are also more likely to be exposed to slimmer ideal body and healthy food advertisements portrayed in the social media. However, people with lower income level and socio-economic status might associate larger body size with being wealthy and healthy because of inaccessibility to those facilities/ being more oriented to cultural values and thereby underestimate their weight. In addition, it was found out that overweight and obese children from poor socio-economic status had lower self-esteem and lower self-perception of social acceptance than overweight and obese children from higher socio-economic status. This could be explained that children from higher socio-economic status might have greater chance to be better in other aspects of their physical appearance such as by wearing stylish clothes, shoes, studying in best schools and also access to many facilities that help them to minimize their social stigma and discrimination. Accessibility to social media might also have helped children from higher socio-economic

status to be more aware that people have many ways in which they can be better despite being overweight or obese.

In 3 of the reviewed studies, it was reported that geographical/area of residence had an influence on weight perception. These studies revealed that overweight/obese respondent from less populated and rural areas were more likely to misperceive their weight than those from high populated and urban areas. And this difference in weight perception could be associated with poor socio-economic status and lower income level that might also contributed to less access for variety of food and physical activities. Thus, it is highly probable that they will associate larger body size with being wealthy and good health. It could also be due to cultural norms that value larger body size as people in rural areas are more oriented to their culture than those in urban areas. However, further research is needed to explore the precise relation of geographical/area of residence and weight perception. Moreover, being married in men and number of births in women were also reported as influential factors to weight perception. But, since each of them were only reported in 1 study more research is needed to confirm whether these factors have influence on weight perception or not.

Socio-cultural-cognitive factors

Some of the reviewed studies have reported that perception of weight was associated with socio-cultural-cognitive factors such as socio-cultural norms, lifestyles, social stigma and stereotypes about obesity, knowledge of ideal body weight, body satisfaction, environmental factors, prevalence of overweight or obesity in their area, family heredity/history and stylish cloth sizes.

African-American and Asian respondents were more likely to be satisfied and feel more attractive with their body than white American females due to their socio-cultural norms that value larger body size, that value character above physical appearance and that associate larger body size with good health. On the other hand, valuing slimmer ideal body size in white American culture negatively affected body satisfaction of overweight and obese white respondents. Thus, the role of cultural norms regarding body weight should be explored deeply in future studies in order to address them in health interventions.

The influence of cultural values and social standards in weight perception across all racial/ethnic groups can also be clearly explained by comparing different racial/ethnic groups living in the same environment with equal access. For instances, both black and white Americans are living in the same environment with almost equal access such as access for food, physical activities, cosmetics, social media and education. However, they displayed significant difference in the way they perceived their body in relation to their weight. This suggested that cultural norms and social standards have stronger influence in weight perception regardless of access for amenities. Therefore, more research is needed to explore the exact influence of cultural values on females' beauty and body satisfaction in different racial/ethnic groups.

With respect to lifestyle factors, overweight and obese respondents with frequent physical activity were more likely to underestimate their weight than those who had sedentary way of life. This could be as a result of associating physical activity and having normal weight without considering the role of nutritional

habit in weight gain. Thus, may be those who were participating in physical activity might have perceived that their weight was maintained normal ignoring the quantity and quality of food they were consuming. Moreover, it was reported that current male smokers were more likely to underestimate their weight than ex-smokers and non-smokers. And among female respondents, non-smokers were more often tended to underestimate their weight than smokers. However, since it was only reported in 1 study, further research is needed to explore whether there is association between being smoker and weight perception.

Although the negative effects of the social stigma and discrimination to obesity reduction has been proved by several studies, only 3 of reviewed studies had addressed this issue and reported that some overweight and obese respondents had negative attitudes towards their body and were trying to distant themselves from being described by the word obesity. It seems that less attention was given to explore the perception of overweight and obese people in relation to the social stigmatization and discrimination. These studies did not also address the effect of internalizing the social stigma and discrimination on psychological wellbeing of overweight and obese people. A review of the literatures of the stigma of obesity by Puhl and Heuer (2010) has proved that perceived stigmatization and discrimination of obese individuals' results in unhealthy behaviours such as unhealthy dieting, lower intention for physical activity and higher levels of eating disorders. The same review has also showed that stigmatization and discrimination has negative effect on health interventions that address obesity [66]. Moreover, it was found out that overweight and obese respondents who internalize weight related stereotypes were more likely to display being eating than those who do not internalize [67]. Therefore, further research should explore the exact influence of internalizing the social stigma and discrimination on weight perception. Besides, awareness of the general public about the effect of the social stigma and discrimination on overweight and obese people behaviour and psychological wellbeing needs to be increased.

Not knowing the cut point for ideal body weight was also reported as influential factor in 3 studies. If people do not have precise idea regarding the ideal weight, it is highly probable that they will either underestimate or overestimate their weight. Additionally, perceiving actual weight status was not only dependent on knowing ideal body weight, but also it seems to be dependent on social standards and the peer groups. In some of the reviewed studies it was found out that if most of the peers which overweight and obese people compare themselves were overweight or obese, there was higher probability of considering their weight status as normal. Moreover, having more overweight and obese family members was associated with perceiving excess weight as normal and in believing weight is attributed due to family heredity.

Health related risk factors

Self-rated health status, health status and perception of weight related health risks were reported as health related factors which influenced weight perception. Self- rating health status as excellent/very good was associated with underestimation of weight and higher body satisfaction. Moreover, having one or more chronic diseases was associated with underestimation of weight in overweight and obese respondents. Being overweight or obese does not mean that it always exposes people to health risks as it is explained by health professionals. There are many other factors that cause diseases. It is also true that

there are many overweight and obese people who have healthier life than normal weight people and the other way round. Thus, we cannot generalize they are always at risk as psychological wellbeing also plays a greater role to attain optimal health. The notion that being overweight and obese people are at higher risk for weight related health problems is the general perception of health professionals. Another Possible explanation for this could also be that respondents with health problems were giving more attention to their diseases which might result in ignoring their weight status. In this review it was also found out that overweight and obese respondents who underestimate their weight were more likely to misperceive that weight is a risk for health. Therefore, much more emphasis should be given in future research on increasing the awareness of weight related health risks.

For someone to attain optimum health, both psychological and physical wellbeing are important. Although being happy and content with body size in black females is good for their psychological wellbeing, they might be exposed to weight related health risks. On the other hand, being more concerned about thin ideal body in white females might expose them to eating disorders and anorexia nervosa. In addition, white females could be susceptible to some psychological health risks as a result of their extreme concern to meet the slimmer ideal body. This suggests that both black and white females are susceptible either to weight related physical health risks or weight related psychological health risks. Therefore, to maintain optimum health among all racial/ethnic groups, much more attention should be given in future research to explore the role of cultural norms on perceiving actual weight status.

Some of the reviewed studies have also reported factors that influence trying/attempting to lose weight in addition to the results presented above. However, since the focus of this review was on weight perception and its associated factors, special attention should be given to the factors that affect trying/attempting to lose weight in future research.

4.2. Limitations of the Study

The validity of the results of this study might have been affected by several potential limitations. Although comprehensive efforts have been made to retrieve all the relevant studies, it is possible some of those relevant studies may have been missed. In addition, since this study addressed only studies written in English, some significant data could have been revealed from other studies which were written in other languages.

4.3. Conclusion

This systematic review concluded that many overweight and obese people underestimate their weight. It was also found out that obese respondents were more likely to underestimate their weight than overweight respondents. Independent of BMI, female respondents were more likely to overestimate their weight, more likely to desire to be thinner and to be more dissatisfied with the way they look than male respondents. And male respondents were more likely to underestimate their weight and to be more confident about their physical competence than females. Among racial/ethnic groups, black Americans

were more likely to underestimate their weight, to be more satisfied with their body, more likely to prefer larger body size and to feel more attractive than white Americans.

Moreover, it was revealed that many normal weight people overestimate their weight, which might expose them to eating disorders and anorexia nervosa. With regard to the factors that influence weight perception, this review has revealed that there are many factors which play a significant role in influencing weight perception. These factors are demographic, socio-cultural-cognitive and health related factors. Out of these factors demographic factors were overrepresented in all the reviewed studies. Despite the negative effect of social stigma and discrimination on the psychological wellbeing of overweight and obese people, this review has shown that less attention was given to understand their perception in relation to this issue.

4.4. Recommendations

Based on the findings from this study, the following points are recommended:-

- Social-norms and cultural values have greater influence on perception. These factors have also significant role in shaping individual behavior. However, this review has demonstrated that less attention was given to the socio-cultural norms and values. Therefore, further research should be conducted to explore the relationship of weight perception and these factors.
- Although health is influenced by many factors, accurate perception of weight status coupled with increased awareness of weight related health risks might contribute significant effect to maintain healthy weight. In addition, it is less likely that overweight and obese people who underestimate their weight will actively participate in weight reduction interventions. Therefore, education of the people about ideal body weight and weight related health risks should be reinforced before implementing weight reduction interventions.
- Socio-cultural-cognitive and health related factors were underrepresented in all the reviewed studies. However, subjective feeling of individuals is more related with socio-cultural-cognitive factors than with demographic factors. Thus, further research is needed to explore the strength of association between weight perceptions and these factors.
- All the factors which were reported as influential factors for weight perception were studied independently in all studies. But, it is important to see how these factors are interrelated to each other in influencing weight perception. Therefore, future research should address the relationship of these factors with regard weight perception.
- Self-reported questionnaire cannot explore ones perception deeply. In-depth interview are more suitable to dig out the feelings and believes of individuals as it gives more space to the researcher to ask the questions in different ways. Therefore, further research with in-depth interview data collection methods should be reinforced to clearly understand the perception of overweight and obese people in relation to their weight.

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Appendix I

Summary Characteristics of the reviewed Studies

Author, year, country, references	Study design, sample, response rate	Main outcomes	Factors that influence perception	Quality of study
Goryński & Michał, 1989, Poland [44]	Cross-sectional survey, Questionnaire interview, data from longitudinal study for chronic non-specific respiratory diseases of residents of Cracow 1868 (783 males and 1085 females)	23.6% of obese/overweight men and 14.5% of obese/overweight women reported that they have normal weight Respondents at older age were more likely to misperceive their weight status Non-smokers were more likely to misperceive their weight than smokers and ex-smokers as being overweight Both male & female respondents from lower socio-economic status and with lower educational level were more likely to misperceive their weight as being overweight Females who did not give birth and who give more than three births were more likely to misperceive their weight as being overweight than females with one, two/three births Health status was not associated with misperception of weight except hypertension in men	Age Gender Lifestyle Educational level Socio-economic status Number of births Health status	Low
Neumark et al., 1999,USA [42]	Quantitative study, semi -structured interview guide, 50(24 African-American and 26 Caucasian) Overweight/obese girls	Body and self-image concerns among African-American and Caucasian girls revealed more similarities than differences Most participants reported high level of dissatisfaction and strong concerns about their body size and shape Almost all respondents reported that being overweight have negatively affected their own body image and their social interactions Both African-American and Caucasian overweight girls expressed concerns about their body shape and size, their desire to be thinner and of being self-conscious about their weight African-American girls were more likely to express the positive aspects of their bodies than the Caucasians	Race/Ethnicity	Medium
Blokstra et al., 1999, Netherlands [46]	Cross-sectional survey, self-administered questionnaire, 4601 (2155 men & 2446 women)	56% of men and 52% of women described their weight as normal weight 41% of overweight men and 30% of overweight women have at least one cardiovascular risk factor Obese men and overweight men with at least one weight related risk factor were less likely to participate in sport in their spare time than those with more than one risk factor Direct association was found between relative fat intake and level of obesity in men but no relationship in women Educational level was inversely proportional with higher obese/overweight women and there were more overweight and obese women from rural areas Obese women were less likely to participate in sport during their leisure time than normal weight women (21% Vs 52%) 55.8% of men believed their weight to be normal and most of them reported that they did nothing to lose weight within the last year About 40% of overweight men and 20%-30% of overweight	BMI Age Gender Educational level in men	High

		<p>women perceive themselves as normal weight</p> <p>Among men weight loss attempt was associated with increasing age</p> <p>51% women reported that they have normal weight and they tend to had strong histories of weight loss attempt than men</p> <p>Overweight women had more stronger histories of weight loss attempts and were more trying to lose weight than normal weight women</p> <p>63% of obese women were trying to lose weight</p> <p>Obese women were more likely to describe themselves as too fat and less likely to attempt weight control than obese men</p>		
Baturka et al., 2000, USA [40]	Qualitative study, In-depth interview using open-ended questionnaire, 24 (12.5% normal weight, 37.5% overweight and 50% obese African American women)	<p>Majority of the women express some degree of dissatisfaction with their current body weight</p> <p>17 (71%) of respondents stated that they want to lose weight</p> <p>11(92%) of obese & 50% of both overweight & normal weight respondents want to lose weight</p> <p>Dissatisfaction with closing, feeling not attractive, feeling unhappy because of the lack of enjoyment inhibited by their weight and fearing of health risks of were reported as the main reasons of wanting to lose weight</p> <p>Believe that family history, traditional eating habits and lack of access for physical activities were the main attributes for their weight gain</p> <p>95% of women who want to reduce their weight believe that they have the ability to do it</p> <p>Respondents reported ambivalence and conflicts with regard their body image</p>	<p>Cultural norms</p> <p>Clothe sizes</p> <p>Family history</p> <p>Environmental</p>	Medium
Madrigal et al., 2000, Europe [24]	Cross-sectional study, Questionnaire, interview 6021 (3215 men & 2806 women) from 15 European countries	<p>More men underestimate their weight than women (65.2% Vs 32.2%)</p> <p>75.1% of obese men & 46.9% of obese women underestimate their weight</p> <p>Highest underestimation of weight was reported from people who live around the Mediterranean areas (68.7% for men & 37.9% for women) than those in Scandinavian</p> <p>More overweight women overestimate their weight than overweight men (7% Vs 2%)</p> <p>Highest underestimation of weight was found among men with university level of education (69.5%)</p> <p>Obese men underestimate their weight almost twice as likely as overweight men</p> <p>Obese women were more likely to underestimate their weight than overweight women</p> <p>Men who do physical activity and women with no physical activity were more likely to underestimate their weight (66.8% Vs 33.6%)</p>	<p>BMI</p> <p>Age</p> <p>Gender</p> <p>Lifestyle</p> <p>Geographical areas</p> <p>Educational level</p>	Medium
Gutierrez et al., 2002, Spain [28]	Three independent Cross-sectional surveys, interview with help of questionnaire ,	<p>28.4% of the participants misperceived their weight as being overweight or obese in 1987 compared to 26.9% in 1995/1997</p> <p>In 1987 36.6% of overweight men & 16.5% of overweight</p>	<p>BMI</p> <p>Gender</p> <p>Age</p> <p>Area of</p>	High

	11496 (6957 in 1987 & 4539 in 1995/1997) from national health surveys data, respondents were ≥ 20 years of age and with BMI ≥ 25 kg/m ² , response rate 81.7% in 1987 and 89.4% in 1995/1997	women misperceive their weight as being overweight In 1995/97 33.2% overweight men & 17.7% of overweight women misperceive their weight Highest misperception of weight was found in those people with BMI between 25-26.9 kg/m ² (50% of men & 30% of women in 1995/97 misperceive their weight as being overweight) 42% of men and 25% of women with BMI between 25 and 28.9 kg/m ² did not perceive themselves to be overweight In 1997 33% of overweight men and 18% of overweight women did not perceive themselves to be overweight	residence Educational level	
Anderson et al., 2002, USA [45]	Survey, telephone-interview, data from the 1996–1997 U.S. Women’s Determinants Study 1700 (52.8% overweight and 47.2% obese) American women from four ethnic groups	Majority of the respondents rated their health as good/better Nearly half women (47.6%) reported that they were not satisfied with their body size Obese women were less likely to express satisfaction with their weight than overweight women Women in the other ethnic groups were more likely to express body satisfaction than non- Hispanic white women 65% of the respondents reported that they are currently trying to lose weight Body dissatisfaction was strongly associated with trying to lose weight Women who reported body dissatisfaction were nine times more likely to report trying to lose weight than women who were very satisfied Women aged 40–69 years were more likely to be trying to lose weight compared with women 70 years and older Women who have higher education level were less likely to express satisfaction with their body size than women with less than a high school educational level Women who rated their health as fair/poor were less likely to express satisfaction with their body size than women who rated their health as excellent/very good	BMI Age Race/Ethnicity Educational level self-rated health status	High
Paeratakul et al., 2002, USA [53]	Cross-sectional study, telephone & face to face interview, data from the Diet and Health Knowledge Survey (DHKS) from 1994- 1996, 7842 males & females (43% normal weight, 37% overweight & 20% obese), response rate 73.5%	Overall, 47% of the respondents reported that they were overweight More women and more whites perceive themselves as overweight compared to men and blacks or Hispanics The proportion of self-perceived overweight was higher in persons with higher income and higher educational level 18% of normal weight respondents reported that they are overweight 60% of overweight and 87% obese respondents perceive themselves as overweight The self-perception of overweight was highest in white women and lowest in black men	BMI Gender Race/Ethnicity Educational level Income level	Medium
Chang et al., 2003, USA [48]	Cross-sectional survey, interview, data from Third National Health and Nutrition Examination Survey conducted from 1988	Overall, 27.5% of women and 29.8% of men misclassified their own weight status 38.3% of normal weight women perceive they were overweight 32.8% of overweight men perceive they were normal weight or underweight	Age Gender Race/Ethnicity Income level Educational level	High

	through 1994 15,593 (8165 women and 7428 men)	95.1% of obese women and 88.1% of obese men consider themselves as overweight Women had over five times greater odds to perceive themselves as overweight than men 60% of men were overweight, but over 30% of them misperceive their weight category Younger men and women were more likely to classify their weight to be in a higher weight category than older ones	Marital status	
Kuchler & Variyam, 2003, USA [52]	Cross-sectional survey, data from the third National Health and Nutrition Examination Survey 1988–1994 (NHANES III) , 16209 (7758 males and 8451 females)	42.7% of overweight males and 11.9% obese males perceive themselves about the right weight/underweight Overweight and obese women were more likely than overweight and obese men to perceive their weight accurately 72.6% of overweight women correctly perceive their weight as overweight, but 18.4% of them perceive themselves as healthy/underweight 35.3% of normal weight women perceive themselves as overweight compared to 10.9% of normal weight men Underassessment of weight status decreases with increasing of educational level both in men and women Obese and overweight non-Hispanic black participants were more likely to underestimate their weight than non-Hispanic white Obese and overweight respondents with higher income were less likely to underestimate their weight than those with lower income Weight underestimation was more common among obese and overweight respondents with older ages The percentage of weight overestimation was lower in healthy weight/underweight smokers than non-smokers Higher percentage of underassessment of weight was reported among overweight food Stamp recipients than among non-recipients	BMI Age Gender Race/Ethnicity Educational level Income level Lifestyle	Low
Brener et al., 2004, USA [60]	Cross-sectional, questionnaire, 2032 students in grades 9 through 12 (52.9% girls and 47.1% boy of which 1.5% underweight, 51.2% normal weight and 47.3% overweight) and 43.2% were white, 40.7% black, 7.9% Hispanic, and 8.2% from other racial/ethnic groups	42.9% of the respondents perceived themselves about the right weight, 34.8% perceived themselves as underweight and 22.3% of them perceived themselves as overweight Girls were more likely than boys to consider themselves overweight Black students were less likely than students in the other racial/ethnic groups to consider themselves as overweight 20% of underweight students and 15.8% of students at risk for underweight perceived themselves normal weight 50.8% and 42.9% of normal weight students considered themselves to be about the right and as underweight respectively 20% and 26.2% of overweight respondents considered themselves to be about the right weight and underweight respectively white girls were more likely than their black counterparts to consider themselves overweight and white boys more likely than their black counterparts to consider themselves underweight	BMI Gender Race/Ethnicity	Medium

Hemiup et al., 2005, USA [27]	cross-sectional survey, structured self-administered survey form 923 (256 men and 667 women)	75% of participants with BMI >30 do not perceive themselves as overweight White respondents were almost three times more likely to report that they are overweight than black respondents Participants who perceive themselves as overweight were more likely in the age group 50-64, females and white and those who rated their health as good, fair/poor	Age Gender Race/Ethnicity Self-rated health status	Low
Bennett & Wolin, 2006, USA [47]	Cross-sectional survey, questionnaire, data from the 1999–2002 National Health & Nutrition Examination Survey, 6552 overweight & obese adults (3115 men & 3437 women)	Men were more likely to misperceive their weight status than women Blacks respondents were most likely to misperceive their weight status than whites Misperception of weight status was higher among overweight than among obese participants The prevalence of misperception was highest among overweight Black women (40.9%) and lowest among obese White women (3.9%) Weight misperception rates were highest among overweight Black men (66.4%), and lowest among obese White men (8.9%) Blacks were twice as likely, and Hispanics were 70% more likely than Whites to misperceive their weight Overweight Black women were twice as likely as Overweight White women to misperceive their weight Obese black women were over three times as likely as White women to misperceive their weight Obese Hispanic women were twice as likely as obese White women to misperceive their weight Higher weight status misperception was reported in both overweight Black men & overweight Hispanic men than overweight white men Obese black men had an increased likelihood of weight status misperception compared to obese Hispanic & obese white men	BMI Gender Race/Ethnicity	High
Howard et al., 2008, Australia [54]	Cross-sectional survey, self-reported questionnaire, data from the North West Adelaide Health Study (NWAHS) collected from 20002 through 2008, 2382 adult people, response rate of 74.3%	59.6% of obese people perceived themselves as a little be overweight and 5.8% of them as normal weight 33.4% of overweight respondents believe that their weight was of normal weight 29.7% of underweight people perceive themselves as normal weight 18.3% of normal weight participants thought that they were a little be overweight & 0.5% perceive that they were very overweight More males underestimate their weight than females (41.5% vs. 32.2%) About 10.5% of females overestimate their weight status Obese people with lowest quintile of disadvantaged and low household income levels and those born from eastern or western Europe were more likely to perceive their weight as a little overweight	BMI Gender Socio-economic status Area of residence Household income level	Medium
Gregory et al., 2008, USA [56]	Cross-sectional study, mail questionnaire, data from the 2004 Porter	Overall, 44% of men disagreed that their weight is risk for health, while 34% of men agreed that it is risk for health Among women 27% disagreed that their current weight is	Gender Race/Ethnicity Income level	High

	Novelli HealthStyles and ConsumerStyles survey databases, 2,631 men and women (51% overweight and 49% obese) Response rate 70% for HealthStyles and 44% for consumerStyles	<p>risk for health and 47% agreed that it was a health risk</p> <p>Men were more likely than women to disagree that their weight was a health risk (62% vs. 43% in overweight and 20% vs. 14%, in obese)</p> <p>Among both overweight and obese participants men were less likely to be trying to lose weight than women (50% vs. 74% and 61% vs. 77%, respectively)</p> <p>Overweight/obese participants who reported excellent health status were more likely to disagree their weight is a risk for health</p> <p>Overweight/obese respondents who have prevalent chronic disease were more likely to agree their weight is a risk for health</p> <p>Participants who agree their weight is a risk for health were more likely to report trying to lose weight than those who disagreed weight is risk for health</p>	<p>Educational level</p> <p>Health status</p> <p>Self-rated health status</p> <p>Perception of weight related health risks</p>	
Gregory et al., 2008, USA [51]	Cross-sectional survey, self-administered survey questionnaire, data from ConsumerStyles and HealthStyles surveys in 2004, 3,888(2,134 women and 1,754 men)	<p>48.1% of normal weight women and 64% of normal weight men perceive their weight was about right, and 46.4% and 21.4%, respectively, described themselves as overweight</p> <p>93% of overweight women and 73.5% of overweight men correctly perceive their weight as overweight, while 6.4 % of women and 25.8% of men perceive themselves about the right weight</p> <p>Among respondent with BMI ≥ 25, women were more likely than men to recognize their overweight status (slightly or very overweight; 93% of women vs. 73.5% of men)</p> <p>70.4% of obese women vs. 49.5% of obese men described themselves as very overweight</p> <p>Men were more likely to underestimate their weight than women</p> <p>Being non-Hispanic black and having lower educational level were associated with underestimating of weight status among overweight respondents</p> <p>Lower income in women and rating health status as excellent/very good in both men and women were associated with underassessment of weight status</p> <p>Obese respondents who rated their health status as better were more likely to underestimate their weight than those who rated poor/fair</p> <p>Underassessment of weight was associated with disagreement that current weight is risk for health in both overweight and obese participants</p>	<p>BMI</p> <p>Gender</p> <p>Race/Ethnicity</p> <p>Educational level</p> <p>Income level</p> <p>Self-rated health status</p> <p>Perception of weight related health risks</p>	Medium
Befort et al., 2008, USA [35]	Focus group, qualitative study, semi-structured open ended questionnaire, 62 obese women 85% attendance rate	<p>Believe that attractiveness does not depend on body size and people with larger size could be attractive</p> <p>Feel dissatisfied with their weight status and are self-conscious about it</p> <p>Emphasize eating behaviour as a cause of weight gain</p> <p>Perceive health problem and functional status as a main factor to loss weigh</p> <p>Prefer lifestyle modification to lose weight and do not believe that medical treatment is effective for weight loss</p>	<p>Socio-culturally influence on body size, traditional nutrition habits and Collectivism</p>	Medium

Truesdale & Stevens, 2008, USA [38]	Cross-sectional survey, self-administrated questionnaire, 104(52 men and 52 women) white and African American	<p>66.7% normal weight and 89.5% overweight women correctly report their weight status</p> <p>33.3% normal weight women and 12.5% of normal weight men perceive themselves as overweight</p> <p>22.2% obese women correctly report that they are obese</p> <p>75% of normal weight men correctly report their weight status</p> <p>12.5% normal weight men underreported their weight status</p> <p>73.3% obese women and 42.7% of obese men perceive themselves as overweight</p> <p>20% obese men perceive themselves as normal weight</p> <p>57.1% overweight men correctly perceive their weight status as overweight</p> <p>49.2% overweight men perceive themselves as normal weight</p> <p>Normal weight men and women approximately know the cut point for BMI to be considered as obese (30.2 kg/m² & 28.9 kg/m², respectively) But obese men & women overestimated the BMI cut point for obesity (34.5 kg/m² and 38.5 kg/m² respectively)</p>	Gender knowledge of ideal body weight	Medium
Lemon et al., 2009, USA [49]	Cross-sectional study, self-administered survey, data from human resources records, 899, (79% women and 21% men, of which 33% normal weight, 32.1% overweight and 34.8% obese) 94.4% response rate	<p>Women were more likely to perceive themselves to be moderately or very overweight than men (41% vs. 24%)</p> <p>Normal weight men were more likely to perceive themselves as underweight than normal weight women (26.8% vs. 6%)</p> <p>Normal weight women were more likely to perceive themselves a slightly or moderately overweight than normal weight men (55.2% vs. 22.7%)</p> <p>53.5% of overweight women perceived themselves slightly overweight and 39.7% of them as moderately or very overweight compared to 61.9% & 9.5% of men, respectively</p> <p>86% of overweight and obese women perceived themselves to be overweight compared to 52% of normal weight women who perceived themselves to be overweight</p> <p>Men were less likely to perceive themselves as overweight across all BMI categories</p> <p>25% of obese women reported their weight as underweight followed by 35% of them who perceive themselves as very overweight</p> <p>Women were more likely to report attempting to lose weight than men</p>	BMI Gender	High
Gilbert et al., 2009, Colombia [29]	Cross-sectional study, self-administered surveys through questionnaire, 671 women (46.5% normal weight 41.9% overweight/obese and 11.6% obese), 81% response rate	<p>Higher educational level and higher socioeconomic status was associated with selection of slimmer body shape as ideal and healthy body</p> <p>Body dissatisfaction was positively related with BMI and educational level</p> <p>Obese women reported higher level of body dissatisfaction than non-obese women</p>	BMI Educational level Socio-economic status	Medium

McCullough et al., 2009, Ireland [34]	Cross-sectional survey, questionnaire, 211(73% normal and 27% overweight/obese children) 92% response rate	<p>Higher BMI was associated with lower self-perceptions of social acceptance and physical appearance</p> <p>Overweight/obese children from more disadvantaged socio-economic status have lower social acceptance score than overweight/obese children from less disadvantaged status</p> <p>Lower self-perception of social acceptance and physical appearance was reported in overweight/obese children with poor socioeconomic status</p> <p>Girls had significantly higher scores than boys in the behavioural conduct domain</p> <p>Boys had significantly higher scores than girls for the athletic competence</p> <p>Many overweight children are not happy with the way they looked compared with normal weight children</p> <p>Some overweight children feel that they are not well liked by their peers</p> <p>Being exposed to impoverished environments in addition to being overweight was associated with lowered self-esteem for some children</p>	BMI Gender Socio-economic status	High
Chang et al., 2009 Malaysia [39]	Qualitative, Focus group, unstructured discussion guide, 38 obese and overweight adults (17 men & 21 women)	<p>Majority of obese & overweight females and some men consider themselves ugly because of their increased waist line</p> <p>Females feel shameful due to their body size</p> <p>Feeling of frustration and less effective in terms of their capability to work was reported in both males and females</p> <p>Majority had negative attitude toward obesity/overweight linked to self-stigmatization</p> <p>All Respondents reported that lack of knowledge, difficulty to resist eating and failed attempts were main reasons for pre-contemplating to weight loss</p>	stylish clothes Prevalence of obesity in their area Social-stigma	Medium
Dorsey et al., 2009, USA [50]	Cross sectional survey, interview, data from the National Health and Nutrition Examination Survey (NHANES) through 1999–2006, 17270 men and women (32.7% obese, 35.5% overweight, 30.2% normal weight and 1.6% underweight) non-Hispanic white, non-Hispanic black and Mexican-American	<p>40% of underweight and overweight respondents believed that they were “about the right weight”</p> <p>8% of obese respondents considered themselves to be “about the right weight”</p> <p>Non-Hispanic black normal weight participants were more likely to perceive themselves as underweight than non-Hispanic white normal weight (19.1% vs 9%)</p> <p>More normal weight men misperceive their weight to be underweight than normal weight women</p> <p>Non-Hispanic whites who were normal weight were more likely to consider themselves “overweight” compared to non-Hispanic blacks (23.9% vs. 8.2%)</p> <p>Healthy weight women perceived themselves as being “overweight” than men</p> <p>More obese and overweight men misperceive their weight than obese and overweight women</p> <p>Overweight and obese non-Hispanic blacks and Mexican Americans were more likely to have a weight misperception than non-Hispanic whites</p>	BMI Race/Ethnicity Gender Educational level	Medium

		Lower educational level was associated with higher misperception of weight status both in men and women and across all BMI categories		
Godino et al., 2010, USA [58]	Survey, telephone interview, 404 Black men(29% normal weight, 45.8% overweight, 25.2% obese)	Obese men were more likely than non-obese men to misperceive their healthy weight Majority of respondents recognized that they should lose weight to attain a healthy weight 90.2% of obese men stated unhealthy weight status as healthy weight Higher underestimation of weight was reported among obese men than overweight and normal weight men Respondents who rated their overall health as good/excellent were more to misperceive healthy weight than those who rated their health as fair/poor	BMI Self-rated health status	Low
Docteur et al., 2010, France [32]	Randomized-control trial Experimental, identification of body image from different photograph of each participant adjusted to different sizes, 60 (20 severely obese, 20 obese & 20 normal weight) females	Severely obese patients correctly perceived themselves as being more corpulent than obese and normal weight females Obese patients correctly perceived themselves as being more corpulent than normal weight females Higher level of body distortion and body dissatisfaction was reported both from severely obese and obese females compared to the normal weight females	BMI	Low
Martínez et al., 2010, Mexico [59]	Qualitative study, Semi-structured interviews, 24 obese adolescents (14 girls & 10 boys) in the 7th to 9th grade of a public school	Respondents reported that they were more heavier than they should weight Believe that family heredity as main cause of obesity Participants use negative terms to describe themselves and had low self-concept and self-esteem and tend to underestimate obesity Being agitated during running, inability to find clothes that fit them, rejection and ridiculed by peers were reported as the main problems encountered due to their weight Participants reported that they are trying to lose weight to defend themselves from being blamed	Family heredity	Medium
Thomas et al., 2010, Australia [57]	Qualitative study, audio-taped telephone interview, 142 (74.6% women and 25.4% men)	40.1% of participants describe their inner characteristics negatively as extreme obese, just bloody fat, grossly overweight , fat Participants who describe themselves negatively were mostly younger women and individuals with BMI > 40 86% of the respondents describe their physical body negatively with words ugly, unattractive, huge gut, horrible and there was also difference of words used between men and women to describe themselves 13% of women under 50 years old and with BMI >40 expressed extreme dislike about their body 48% of respondents blame themselves for their weight gain and reported that they constantly worried about their physical appearance More women blame themselves for their weight gain, while men described as it was as a result of focusing on social	BMI Age Gender Socio- cultural norms Lifestyle Social stigma and stereotypes	High

		<p>expectation to provide good take care of their families</p> <p>Women reported that they are always aware of being overweight , while men often attributed being bigger to masculine characteristics of strength and power</p> <p>Many participants described feelings of ‘guilt’, ‘shame’ and ‘blame’ associated with their weight</p> <p>Respondent report that they were striving for perfection in other areas of their life, social isolation, maximizing aspects of their appearance and ‘fat’ acceptance as a way of coping mechanism to weight related stigma</p>		
Rudolph et al., 2010,Germany [55]	Survey, data from clinical based case- control study, questionnaire, 155 obese and normal weight children	<p>87.3% of obese and 81.1% of normal weight children estimated their weight status correctly</p> <p>Obese patients wished to change their weight more frequently and reported more weight concerns than normal-weight individuals</p> <p>Normal weight girls reported significantly more weight concerns than normal weight boys, but no significant difference was reported among obese children</p> <p>Self-concept of obese patients was significantly more negative than that of normal-weight children in all domains assessed by the SPPC-D with more effect on physical appearance than other domains</p> <p>Most participants were sure/very sure that they were able to lose weight</p> <p>Majority of obese children had reported physical activity was their habit</p>	BMI Gender	Medium
Moore et al.,2010 USA [37]	Cross-sectional survey, survey questionnaire, 323 (1.5% underweight, 18.3% normal weight, 25.7% overweight, 54.5% obese &) women	<p>Generally underestimation of weight was common in both overweight and obese respondents</p> <p>72% of obese women perceive themselves as overweight</p> <p>13.6% obese women correctly perceive themselves as obese</p> <p>44% of overweight women consider themselves as normal weight</p> <p>Obese women reported having a higher susceptibility of weight related disease than women of normal weight</p> <p>Overweight people reported that they are at equal risk of having weight related diseases with normal weight</p>	BMI knowledge of ideal body weight Perception of weight related health risks	Medium

Edwards et al., 2010, USA [30]	Survey, self-administered questionnaire, data from the Centers for Disease Control and Prevention (CDC) national Youth Risk Behaviour Survey (YRBS) collected 1999 through 2007 (15349, 13601, 15214, 13917 and 14041) in 1999, 2001, 2003, 2005 and 2007 with response rate 66%, 63%, 67%, 67%, & 68% respectively and the percentage of people with BMI ≥ 85 th percentile were 25% in 1999, 24% in 2001, 27% in 2003, 29% in 2005, and 29% in 2007	<p>From 1999 to 2007 the proportion of overweight adolescents who misperceive their weight ranged from 29% to 33%. And in each year the proportion of misperceives was 30.6% in 1999, 30.7% in 2001, 31.2% in 2003, 29.3% in 2005 and 32.8% in 2007</p> <p>In 2007, 0.8% of overweight respondents defined themselves as “very underweight,” 1.7% as “slightly underweight,” 30% as “about the right weight,” 56% as “slightly overweight,” and 12% as “very overweight.”</p> <p>In 2007 23% of overweight girls & 40% of overweight boys misperceive their weight</p> <p>Generally almost 1 out of 3 overweight adolescents do not perceive themselves as overweight</p> <p>45.2% of African-American respondents misperceive their weight status compared to 34.7% Hispanic and 28.2% of white respondents</p> <p>Overweight adolescents who accurately perceive themselves as overweight were more likely to report that they are trying to loss their weight than overweight those who misperceive their weight status</p> <p>Overweight males were more likely to misperceive their weight than overweight females</p> <p>African-American & Hispanic respondents were more likely to misperceive their weight than white Americans</p>	Gender Race/Ethnicity	High
Jones et al., 2010, USA [26]	cross-sectional study, self-reported online survey questionnaire, 173 male and female adults with class II obesity	<p>50.9% of them perceive themselves as overweight</p> <p>49.1% of them correctly classify themselves as obese people</p> <p>Male individuals were more likely to underestimate their weight than females (67.9% Vs 47.6%)</p> <p>Obese individuals who underestimate their weight reported that they had less binge eating , less eating disorder psychopathology, less distress regarding overeating and loss of control over eating than those who correctly report their weight as obese individuals</p>	Gender	Medium
Lewis et al., 2010, Australia [23]	Qualitative study, in-depth semi-structured telephone interview between April 2008 to March 2009, 141(105 women and 36 men, of which 62.4% were obese and 37.6% severely obese)	<p>Obese individuals perceive themselves as overweight</p> <p>Tend to distance themselves from stereotypes related to obese persons and from people who are more obese than themselves</p> <p>Do not believe that their weight can be a risk for health</p> <p>Believe that social and environmental factors are the causes of their weight status</p> <p>Severely obese people perceive themselves as obese and define themselves with the stereotypical language for obese people</p> <p>Most believe that their weight status is risk for health & blame themselves as a cause of their weight gain</p> <p>Both obese & severely obese individuals believe that they are personally responsible for changing their health behaviours and to lose their weight</p>	BMI Lifestyle Stigma and social stereotypes about obesity	High
Kelly et al., 2011 USA [25]	Exploratory research, questionnaire interview, 58 overweight girls in	99% of the study participants prefer smaller body size than their current weight although black girls prefer larger body size than white girls	BMI Race/Ethnicity	Medium

	randomized trial for paediatric overweight (66% black & 34% white)	Both black & white girls were highly dissatisfied with their body size Most girls in both races underestimate their weight		
Duncan et al., 2011, USA [31]	Cross-sectional survey, data from National Health and Nutrition Examination Survey (NHANES) completed from 2003-2006 15079 overweight and obese adults both men and women (50.6% overweight and 49.4% obese)	About 23% of both overweight and obese men and women misperceive their weight Overweight/obese men and women who misperceive their weight were 71% and 65% less likely to report wanting to lose weight than those who accurately perceive themselves as overweight/obese Overweight/obese men and women who misperceive their weight status were 60% and 56% respectively, less likely to have attempted to lose weight than those who correctly perceive their weight status Among black men and women who misperceive their weight status, 77% were less likely to have tried to lose weight in the past year compared to blacks who correctly perceive themselves as overweight and obese Men who misperceived their weight were less likely to be insufficiently active compared to being sedentary Women who misperceive their weight were less likely to meet activity recommendations compared to being sedentary Weight misperception was associated with lower total energy intake among Hispanic women, but not in others	Gender Race/Ethnicity	High
Bhanji et al., 2011 Pakistan [36]	Cross-sectional study, face to face interview with the help of Structured questionnaire, 560 men and women (45.8% obese, 18% overweight), 89% response rate	73% of obese people did not perceive themselves as obese although 50% of them thought they may be overweight 46% of overweight individuals misperceive their weight status as being overweight More males misperceive their weight than females both in obese (84% vs 52%) and in overweight (57% vs 41%) Respondent who reported that they feel happy or they were not concerned about their weight were more likely to underestimate their weight than those who were dissatisfied with their current weight Presences of comorbid diseases was associated with misperception of weight	BMI, Age Gender knowledge of ideal body weight Health status socio-cultural norms body satisfaction	High
Baur et al., 2012 Pakistan [41]	Cross-sectional study, questionnaire, 768 men firefighters (86.1% overweight and obese)	89%, of normal weight, 32.4% overweight and 8.2% obese firefighters correctly perceive their weight status 68% of the overall obese and overweight firefighters underestimate their weight and believe that they are normal, healthy and muscular 34.4% obese individuals who perceive themselves as normal weight reported that they want to reduce their weight by 10 pounds compared to 69% of those who believe that they were overweight and 82.5% of those who correctly perceive themselves as obese	BMI Health status Weight status of peer groups and general population (prevalence)	Medium
Huey, 2013 USA [33]	Cross-sectional, 1694 (531 black & 1163 white) obese and overweight women were selected from data of wave VI longitudinal	Although black women were heavier than white but they perceived as being less overweight and more attractive than white women BMI & attractiveness were negatively correlated for white women but no association was found for black women	BMI Race/Ethnicity	Medium

	national study on adolescents health from 1994-1995			
Willows et al., 2013, Canada [43]	Cross-sectional study, questionnaire, 202(28.2% overweight, 45% obese and 26.8% normal weight) children	<p>40% of them had low global self-concept indicating that they had serious doubts about their self-worth and low self-confidence</p> <p>34.7% of respondents did not like the way they look</p> <p>46.3% of them scored low on the physical appearance and attributes domain of self-concept indicating poor self-esteem in relation to their body image and physical strength and feeling of unattractive</p> <p>Overweight and obese children were more likely to wish to be thinner, to report their body size was too big and not to like the way they look than normal weight children</p> <p>Girls were more likely to desire to be thinner, not to like the way they look, to have lower scores for global self-concept and physical appearance and attributes than boys</p> <p>The degree of not to like the way they look and the desire to be smaller in body size and lower scores for physical appearance and attributes was increasing with age</p> <p>Higher BMI was significantly related with lower scores for global self-concept, intellectual and school status, physical appearance and attributes</p>	BMI Age Gender	High

Appendix II

Detailed Description of the Age categories of Respondents of the Reviewed Studies

Age in years	Authors	Number of Studies
6-11	Kelly et al., 2011	1
8-9	McCullough et al., 2009	1
9-12	Willows et al., 2013	1
11-15	Martínez et al., 2010	1
7-17	Rudolph et al., 2010	1
12-18	Brener et al., 2004	1
14-18	Edwards et al., 2010	1
14-20	Neumark et al., 1999	1
≥15	Madrigal et al., 2000	1
≥18	Bennett & Wolin, 2006, Befort et al., 2008, Gregory et al., 2008, Lemon et al., 2008, Howard et al., 2008, Gregory et al., 2008, Jones et al., 2010, Moore et al., 2010, Bhanji et al., 2011, Baur et al., 2012	10
≥20	Gutierrez et al., 2002, Paeratakul et al., 2002, Kuchler & Variyam, 2003, Chang et al., 2003, Dorsey et al., 2009, Duncan et al., 2011	6
19-75	Lewis et al., 2010, Thomas et al., 2010	2
20-58	Docteur et al., 2010	1
20-64	Hemiup et al., 2005	1
20-65	Blokstra et al., 1999	1
21-55	Gilbert et al., 2009	1
21-47	Baturka et al., 2000	1
24-32	Huey, 2013	1
25-65	Chang et al., 2009	1
32-83	Goryński & Michał, 1989	1
≥40	Anderson et al., 2002	1
45-64	Truesdale & Stevens, 2008	1
45-70	Godino et al., 2010	1

Appendix III

Detailed Description of BMI Categories of Respondents of the Reviewed Studies

Studies/Authors	Underweight	Normal/about the right weight	Overweight	Obese	Overweight /Obese
Moore et al., 2010	1.5%	18.3%	25.7%	54.5%	
Lemon et al., 2008	0.5%	32.5%	32.1%	34.9%	
Dorsey et al., 2009	1.6%	30.2%	35.5%	32.7%	
Howard et al., 2008	1.5%	31.6%	38%	28.9%	
Brener et al., 2004	1.5%	51.2%	47.3%		
Chang et al., 2003	2.5%	42.6%	54.9%		
Baturka et al., 2000		12.5%	37.5%	50%	
Bhanji et al., 2011		36.2%	18%	45.8%	
Blokstra et al., 1999,		46.6%	43.1%	10.3%	
Gilbert et al., 2009		46.5%	41.9%	11.6%	
Godino et al., 2010		29%	45.8%	25.2%	
Gregory et al., 2008		34.1%	33.1%	32.8%	
Hemiup et al., 2005		14.5%	34.2%	51.3%	
Paeratakul et al., 2002		43%	37%	20%	
Truesdale & Stevens, 2008		29.8%	38.5%	31.7%	
Willows et al., 2013		26.8%	28.2%	45%	
Goryński & Michał, 1989		60.4%	39.6%		
Docteur et al., 2010		33.3%		66.6%	
Rudolph et al., 2010		61.9%		38.1%	
Kuchler & Variyam, 2003		45.4%			54.6%
McCullough et al., 2009		73%			27%
Anderson et al., 2002			52.8%	47.2%	
Chang et al., 2009			63.2%	36.8%	
Duncan et al., 2011			50.6%	49.4%	
Gregory et al., 2008			51%	49%	
Madrigal et al., 2000			76.4%	23.6%	
Gutierrez et el., 2002			100%		
Kelly et al., 2011			100%		
Neumark et al., 1999			20%	80%	
Befort et al., 2008				100%	
Jones et al., 2010				100%	
Lewis et al., 2010				100%	
Martínez et al., 2010				100%	
Thomas et al., 2010				100%	
Baur et al., 2012					100%
Bennett & Wolin, 2006					100%
Huey, 2013					100%
Edwards et al., 2010			25%, 24%, 27%, 29%, 29% (199-2007)		

Appendix IV

Underestimation of weight by BMI and Gender

Normal weight		Overweight		Obese		Overweight/obese		References
Male	Female	Male	Female	Male	Female	Male	Female	
				75.1%	46.9%			24
				67.9%	47.6%			26
				50.9%				27
				75%				
		36.6%, 33.2%	16.5%, 17.7%			28.4%, 26.9%		28
		40%	23%					30
						23%		31
		57%	41%	84%	52%			36
		46%		73%				37
			44%		72%			
12.5%		49.2%		93.3%	77.8%			38
		67.6%		91.8%		68%		41
						23.6%	14.5%	44
		40%	20%-30%					46
		32.8%		88.1%	95.1%			48
26.8%	6%				60%			49
				8%				50
		25.8%	6.4%	49.5%	70.4%			51
		42.7%	18.4%	11.9%				52
		60%		87%				53
		33.4%		65.4%				54