

## Awareness of BMI Among Health Professionals in Tertiary Care Hospitals: A Cross-sectional Study

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### ABSTRACT

**Objective:** The main objective of our study was to determine awareness and knowledge of BMI amongst physicians in two urban tertiary care centers (Civil Hospital Karachi and Jinnah Postgraduate Medical Center).

**Methodology:** This was a comparative cross-sectional, observational, questionnaire-based study conducted at Civil Hospital Karachi and Jinnah Postgraduate Medical Center, Karachi, between May 3, 2013, and December 6, 2013. A total of 382 doctors completed our predesigned questionnaire. First, we asked the participants to report their own height, weight, BMI, BMI formula and the normal BMI ranges. Upon completion of the questionnaire we measured their actual height, weight, and BMI with the help of standardized scale.

**Results:** A total of 382 physicians were included in our study; 160 were males (41.9%) and 222 (58.1%) were females. The mean age was 29.99 ( $\pm$  5.47) years old. Only 118 (30.9%) performed some form of exercise. Interestingly, only 286 (74.9%) physicians knew their own height while 310 (81.2%) knew their own weight respectively. While inquiring about their knowledge of Body Mass Index (BMI) 306 (80.1%) doctors reported they knew the concept and importance of BMI. However, only 112 (29.3%) knew the correct formula to calculate one's own BMI. Moreover, only 110 (28.8%) physicians knew their exact BMI while 272 (71.2%) were completely unaware.

**Conclusion:** It is imperative for medical professionals to have self-awareness and knowledge of Body Mass Index (BMI) and its effects on health. Educational activities and modules should be created to promote awareness of these matters. Initiatives to increase knowledge of BMI and healthy ranges will benefit physicians in attaining a greater understanding of their own health as well as that of their patients.

**Key words:** Body Mass Index; BMI; Health Professionals; Tertiary care hospitals

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عنوان: تیسرے درجے کے دو اعلیٰ ہسپتالوں میں طب سے منسلک پیشہ ورانہ افراد کی BMI کے بارے میں معلومات کی جانچ۔

مقصد: موٹاپا بہت سی بیماریوں کی جڑ ہے۔ اس مطالعہ کا اہم مقصد کراچی کے دو بڑے ہسپتالوں (سول ہسپتال کراچی اور جناح پوسٹ گریجویٹ میڈیکل سینٹر کراچی) میں کام کرنے والے پوسٹ گریجویٹ طلباء اور ڈاکٹروں میں BMI کے بارے میں معلومات کا جائزہ لینا ہے۔

طریقہ: یہ مشاہداتی، تقابلی کراس سیکشنل سوالنامہ پر مشتمل مطالعہ سول ہسپتال کراچی اور جناح پوسٹ گریجویٹ میڈیکل سینٹر کراچی میں 3 مئی 2013 سے 2 دسمبر 2013 کے دوران یہ کیا گیا۔ مجموعی طور پر 382 ڈاکٹرز نے اس سوالنامہ کو پُر کیا۔ پہلے ان سے انکے قد، وزن، BMI، BMI کا فارمولا اور BMI کی نارمل حد معلوم کی گئی۔ سوالنامہ کو پُر کرنے کے بعد انکے حقیقی قد، وزن، BMI کی پیمائش کی گئی۔

نتیجہ: حاصل ہونے والی معلومات کے مطابق مجموعی طور پر 382 ڈاکٹرز اس مطالعہ میں شامل ہوئے جس میں سے 160 (41.9%) مرد اور 222 (58.1%) خواتین تھیں۔ جنکی اوسط عمریں 29.99 ( $\pm$  5.47) معلوم ہوئیں۔ صرف 118 (30.9%) ڈاکٹرز تھوڑی بہت ورزش کرتے ہیں۔ دلچسپ بات یہ ہے کہ صرف 286 (74.9%) ڈاکٹرز اپنے قد اور 310 (81.2%) اپنے وزن کے بارے میں صحیح معلومات رکھتے تھے۔ BMI کے بارے میں انکی معلومات کی جانچ کیلئے پوچھے گئے سوال کے جواب میں 306 (80.1%) ڈاکٹرز نے بتایا کہ انھیں BMI کا تصور اور اہمیت کا اندازہ ہے جبکہ 112 (29.3%) ڈاکٹرز کو اپنا BMI معلوم کرنے کا صحیح کلیہ معلوم تھا۔ مزید یہ کہ صرف 110 (28.8%) ڈاکٹرز کو اپنا BMI کیلئے بالکل صحیح پیمائش کا طریقہ (71.2%) 272 اس معلومات سے بالکل نہ واقف تھے۔

حاصل مطالعہ: طب سے منسلک پیشہ ورانہ افراد کے لئے لازمی ہے کہ BMI کی اہمیت اور صحت پر اس کے اثرات کی معلومات سے آگاہی رکھیں جس کے لئے آگاہی اور تربیتی سرگرمیوں کا انعقاد کرنا چاہیے۔ جس کی بدولت ڈاکٹرز کی، خود کی اور مریض کی صحت اور BMI کی صحیح حد کا تعین کرنا آسان ہوگا۔

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## INTRODUCTION

Internationally, increasing prevalence of obesity is a considerable threat to public health and contributes significantly to the burden of disease as much as, if not more than other risk factors<sup>1,2</sup>. Obesity has a strong association with various common medical conditions such as diabetes, systemic diseases (cardiovascular, gastrointestinal, and respiratory), osteoarthritis, abnormal menses, infertility, and many others<sup>3</sup>. High body mass index (BMI) is a major risk factor for mortality of many cardiovascular diseases such as coronary heart disease and ischemic and hemorrhagic stroke<sup>4</sup>. Additionally, obesity in mid-life is strongly related to reduced probability of long-term healthy survival in women<sup>5</sup>. It has also been suggested that a high BMI may be an independent risk factor for musculoskeletal disorders such as low back pain, neck pain, shoulder pain and pain in upper and lower limbs<sup>6-9</sup>. This is an important association for physicians since many of them are required to be “on-call” for long periods of time without rest. Conversely, underweight people are at risk for irregular menstruation<sup>10</sup>, weak immunity<sup>11</sup> and osteoporosis<sup>12</sup>.

While physicians are increasingly becoming aware of the medical consequences of obesity, it is important to re-evaluate how body fat is determined. Firstly, BMI is generally conducted in the adult population. Its popularity stems in part from its convenience, safety and minimal cost. Although it conveys much useful information, it is unable to distinguish lean body mass from fat mass<sup>13</sup>. It is an indirect means to measure a person’s body fat based on a person’s height and weight. Recently, awareness of BMI among the general population has increased in developed countries while developing countries like Pakistan seem to have less awareness. It is not uncommon for health professionals in developing countries to lack knowledge of their own BMI and the implications it carries. Growing evidence suggests that actual weight and perception of weight status often do not coincide and that a greater difference between actual and perceived weight status is more common among overweight and obese individuals<sup>14-17</sup>. As many studies have been conducted on BMI knowledge and awareness among the general and medical student population, we chose to pursue postgraduate physicians for the purposes of our study.

## METHODOLOGY

This was a questionnaire-based cross-sectional study conducted from May 3, 2013, to December 6, 2013, at Civil Hospital Karachi (CHK) and Jinnah Postgraduate Medical Center (JPMC). Both are government owned tertiary care hospitals and two of

the oldest medical institutions in the country. The vast majority of the patient population served by both institutions comes from low socioeconomic backgrounds. Civil Hospital Karachi (CHK) and Jinnah Postgraduate Medical Center (JPMC) are both staffed by highly trained doctors, nurses, technicians and ancillary support staff.

The questionnaire was designed with guidance and assistance from the Department of Community Medicine at Dow University of Health Sciences. An extensive search was completed using the PUBMED, MEDLINE, and Google Scholar databases to extract relevant data in order to produce an accurate questionnaire. The keywords used were “BMI awareness among physicians”, “doctors’ knowledge of own BMI”, “BMI in Pakistan”, “Weight and height of doctors” and “Doctors’ health awareness”. The questionnaire was divided into four sections containing questions about gender, marital status, exercise habits, self-reported measurements and BMI, and knowledge regarding various aspects of BMI. Height and weight were obtained using a portable height/weight machine.

The target population of our study consisted of physicians (interns, residents, fellows, assistant professors, associate professors, and professors) of both Civil Hospital Karachi and Jinnah Postgraduate Medical Center. This study targeted physicians from various departments in both institutes. A total of 382 health professionals were included in our study. Only physicians who were voluntarily willing to participate and gave written consent were included. Furthermore, only physicians affiliated with Civil Hospital Karachi (CHK) and Jinnah Postgraduate Medical Center (JPMC) were included. Physicians who did not volunteer or were unwilling to have their anthropometric measurements taken were excluded. After completing the questionnaire we measured the actual height and weight of the individual with the help of a standardized mechanical scale with high-precision. BMI was calculated using the formula (weight in kilograms/height in m<sup>2</sup>) and the actual state of health according to their BMI was also determined. This information was also shared with the participants for their own knowledge. The reference ranges of body mass index (BMI) are shown in Table 1.

Table 1: Reference Asian and Worldwide Ranges of Body Mass Index (BMI)

Classification	Asian Range	Worldwide Range
Underweight	<17.50	<18.50
Normal Weight	17.50 - 22.99	18.50 - 24.99
Over Weight	23.00 - 27.99	25.00 - 29.99
Obese	>28.00	>30.00

The Ethics Review Committee of the Dow University of Health Sciences approved the study. Informed written consent was obtained from each volunteer through a consent form which was attached with the questionnaires. Participant confidentiality was maintained through the use of study subject numbers rather than patient names for identification and data entry.

The investigators first attained permission from both institutions Civil Hospital Karachi (CHK) and Jinnah Postgraduate Medical Center (JPMC) to carry out the study. Those individuals who were present at the time of investigation were asked to complete questionnaires. Hence, convenient sampling was conducted. Doctors were approached during lunch, breakfast, break time, in the clinic, in the out-patient department (OPD), emergency room, and various other departments throughout the institutions. All individuals willing to participate were given a full explanation of the methods and protocols of this study; additionally, they were assured that total anonymity and confidentiality would be practiced with regards to their identity and answers. Written informed consent was taken from all volunteers who participated.

Although we were persistent regarding the completion of the entire questionnaire, some of the questionnaires were incompletely answered and were excluded from the study. Data from the questionnaires was entered in a database using Statistical Package for Social Sciences (SPSS) version 17 for analysis. Descriptive statistics (means, standard deviations, and percentages) were calculated for height, weight and BMI in both males and females separately, and formed the mainstay of our analysis. Frequencies for each categorical variable were calculated as well.

## RESULTS

A total of 382 health professionals were included in our study; the majority consisted of females 222 (58.1%), along with 160 (41.9%) males. The mean age was 29.99 ( $\pm 5.47$ ) years old. Only 118 (30.9%) participants exercised on a regular basis. Interestingly, 286 (74.9%) knew their own height while 310 (81.2%) knew their own weight. When, inquiring about their knowledge regarding BMI, 306 (80.1%) reported that they understood what BMI is, but only 112 (29.3%) knew the correct formula. Remarkably, only 110 (28.8%) individuals correctly stated their own BMI while 272 (71.2%) were unaware.

With regards to both male and female, 266 (69.6%) knew their exact height. However, in males and females separately, it was observed that only 108 (67.5%) males and 158 (71.17%) females knew their own height

respectively. Interestingly, the majority of the physicians in our study reported their height measurement in feet and inches, not meters and centimeters. A total of 150 (56.4%) reported their height in feet while 116 (43.6%) reported their height in meters.

The investigators measured the height of the participants with the help of a standard measuring scale. The mean height in males was ( $1.69 \pm 0.074$  meter) while the mean height in females was ( $1.59 \pm 0.061$  meter). In addition, we noticed there was a small difference between the perceived and actual height among both genders. Thus, 14 (12.9%) males and 18 (11.39%) females in our study group misperceived regarding their height as they thought that they were taller. A total of 294 (77.0%) participants, both male and female, knew their own weight. Independently, it was determined that 122 (76.25%), out of a total 160 males who were approached, correctly identified their weight; while 172 (77.47%), out of a total 222 females, knew their correct weight, respectively. All participants reported their weight in kilogram (Kg).

After determining the weight of each individual with the help of the standard measuring scale, we learned that the mean weight in males was ( $69.35 \pm 11.35$  kg), while the mean weight in female was ( $56.75 \pm 10.62$  kg). Thus, we discovered that there was a greater difference between the actual and perceived weight than height in both groups. Out of all males, 68 (55.7%) misperceived their weight, and when compared to their actual weight, it was revealed that 42 (61.7%) reported less weight and 26 (38.25%) reported more weight. Likewise, out of all females 114 (66.27%) misperceived their weight, and when compared to their actual weight, it was revealed that 40 (35.08%) reported less weight and 74 (64.9%) reported more weight.

When inquiring about the perception of their own health status with regards to the international classification of BMI, 42 (10.9%) reported as underweight, 256 (67.01%) reported as normal, 64 (16.7%) reported as overweight and only 20 (5.2%) reported as obese. When comparing both groups of gender separately, 12 (7.5%) males reported themselves as underweight, 110 (68.7%) reported as normal, 32 (20%) reported as overweight and only 6 (3.75%) reported as obese. However, in females 30 (13.5%) reported themselves as underweight, 146 (57.03%) reported as normal, 32 (14.4%) reported as overweight and 14 (6.3%) reported as obese.

After taking the participants' height/weight and calculating their respective BMI, it was noted that 48 (12.6%) were underweight, 218 (57.1%) were normal weight, 98 (25.7%) were overweight and 18 (4.7%)

were obese. In males, 8 (5%) were underweight, 94 (58.75%) were normal, 54 (33.75%) were overweight and only 4 (2.5%) were obese. In females, 40 (18.01%) were underweight, 124 (55.85%) were normal, 44 (19.8%) were overweight and 14 (6.3%) were obese. On comparing perceived state of health with their actual state, it was seen that females tend to consider themselves as overweight more often than males. This can be appreciated by noticing that 46 (20.7%) females reported to be in the higher category of BMI like obese or overweight when in reality they were in the lower category of BMI like underweight or normal. Conversely, only 14 (8.75%) males stated they were in the higher category of BMI when they actually were not.

While inquiring about the participant's knowledge of BMI, 306 (80.1%) stated that they knew what BMI actually means. Additionally, only 112 (29.3%) were familiar with the correct formula to calculate BMI. Only 110 (28.8%) individuals were aware of their actual BMI. A total of 214 (56.0%) postgraduate medical professionals consider their BMI range as [18.5-24.9], 160 (41.9%) consider [16.5-18.5] and 8 (2.1%) consider [12.5-16.5].

After measuring all the participants' height, weight and calculating their BMI, it was observed that the mean BMI of males was ( $23.9 \pm 3.49$ ) while the mean BMI of females was ( $22.36 \pm 4.33$ ).

## DISCUSSION

Obesity is one of the most important and independent risk factors for many major medical illnesses such as diabetes and systemic diseases (cardiovascular, respiratory, gastrointestinal, rheumatological and others) as shown by various studies<sup>3</sup>. Obesity is in particular associated with many cardiovascular diseases such as coronary artery diseases (angina and myocardial infarction), stroke, hypertension, and others as shown by other studies conducted in our region and in western countries<sup>3,4,18-21</sup>. People having high BMI may experience various joint problems like back pain, shoulder or hip pain<sup>6-9</sup>.

BMI is an important measure to assess obesity and health status in adult population. It has a simple formula which uses height and weight of a person. The world health organization (WHO) has classified different ranges of BMI for the Asian population than the rest of the world. According to WHO criteria for Asians, people having BMI from 17.50-22.99 are classified as normal, people having BMI below 17.50 are underweight and those having BMI above 22.99 are considered as overweight which is slightly different from rest of the world. Awareness regarding BMI has

increased in developed countries. Conversely the general population of developing countries like Pakistan has little awareness of BMI. Surprisingly, the health professionals in Pakistan also seem to lack awareness of BMI and its implications. Various studies have already been conducted regarding the awareness of BMI among the general population and medical students. We chose to assess specifically the population of postgraduate physicians in two of the largest medical institutions in Pakistan.

Firstly, we asked the participants to report their own height, weight, BMI, the formula of BMI, ranges of BMI in Asian population and perception of their health status. Out of 382 participants, 266 (69.6%) knew their height and only a small fraction of people slightly misperceived their height. But the results on weight status were very interesting and there was a major difference between actual and perceived weight in both males and females.

In our study, many of the overweight and obese males considered themselves as underweight or normal. Our study shows that out of all males, 68 (55.7%) misperceived their weight, and when compared to their actual weight, 42 (61.7%) reported less weight and only 26 (38.25%) reported more weight than actual. After calculating their actual BMI with the help of measured height and weight and comparing it with reported status of health, the finding was also consistent. Twelve (7.5%) males reported themselves as underweight, 110 (68.7%) reported as normal, 32 (20%) reported as overweight and only 6 (3.75%) reported as obese and while actually 8 (5%) were underweight, 94 (58.75%) were normal, 54 (33.75%) were overweight and only 4 (2.5%) were obese. A study conducted in Minnesota showed that males tend to perceive themselves as normal while they were actually overweight and underestimation is more common than overestimation<sup>26</sup>. Similar studies in residents of China showed that males were more likely to underestimate weight than females<sup>27</sup>. This misperception among males could be due to many reasons. Bhanji et al. reported that few factors associated with underestimation of weight were age, gender, being happy, not thinking about one's weight, and co morbidity<sup>28</sup>.

Females tend to misperceive their weight more often than their male counterparts and the majority of them consider themselves as overweight or obese when actually they are usually normal or underweight. Out of all females, 114 (66.27%) misperceived their weight, and when compared to their actual weight, it was revealed that 40 (35.08%) reported less weight and 74 (64.9%) reported more weight. After calculating their actual BMI with the help of measured height and weight and comparing it with reported status of health, the

finding was also consistent; 30 (13.5%) females reported themselves as underweight, 146 (57.03%) reported as normal, 32 (14.4%) reported as overweight and 14 (6.3%) reported as obese; while actually 40 (18.01%) were underweight, 124 (55.85%) were normal, 44 (19.8%) were overweight and 14 (6.3%) were obese. These findings are consistent with other studies conducted throughout the world<sup>14-17,22-24</sup> that show that perceived and actual weights do not coincide in most of the cases and women perceived themselves as overweight more often than men. This is very alarming as females who consider themselves as overweight and obese are more likely to suffer from eating disorders. Wardle et al. showed that about 50% of the female students from 22 different countries considered themselves overweight and were trying to lose weight despite the fact that a majority of them had normal BMI values, perceptions of being overweight and attempts to lose weight were highest in the group of Asian countries where body weights are generally low<sup>22</sup>. Another study conducted in students of Turkey reported 35.5% participants as wanting to lose weight, with weight losing intentions and interventions more common amongst girls<sup>25</sup>.

Our study is the first to report comprehensive findings regarding the awareness of BMI (formula of BMI, its ranges and etc) amongst physicians. Our study shows that 306 (80.1%) stated that they knew what BMI actually means. But only 112 (29.3%) were familiar with the correct formula to calculate BMI and, only 110 (28.8%) individuals were aware of what their own BMI was.

## CONCLUSION

Since increased weight is considered an independent risk factor for many diseases, constant monitoring of one's own BMI should be encouraged for early detection of obesity, especially among healthcare professionals. From our study, it is evident that many doctors from urban health centers within our region have limited knowledge regarding BMI which results in a misperception of their own overall health status. In addition, it is known that the general population and health professionals of developed countries have a good understanding of BMI and its significance. Therefore, we believe it is vital for Pakistani doctors to also be well-educated in this regard which will help them to better understand not only their own health status but of their patient's as well.

**Study Limitations:** The most important limitation of our study was that it was a cross-sectional study conducted from only two institutions within the city

of Karachi, Pakistan. Although both hospitals consisted of a heterogeneous environment from various backgrounds and ethnicities, it cannot serve as a standard for the entire Pakistani physician population. In other words, we can say that generalizability is limited. Furthermore, convenient voluntary sampling method was employed which does not truly represent every health care professional within the country. Hence, to improve generalizability, multi-institutional studies of this type should be carried out within the country which will help generate a greater overall understanding. Nevertheless, our strategy may serve as the cornerstone of awareness for physicians to have a greater knowledge regarding their own BMI.

**Competing Interests:** The authors declare that they have no competing interests. The authors did not receive any funding to complete this study.

**Authors' contributions:** Dr Muhammad Iqbal Afridi and Dr Saad Hameed conceived the study. Dr Beenish Nisar Ahmed searched for literature and analysis of data. Dr Muhammad Waqas Nisar Ahmed contributed in data collection, analysis and review. Dr Muhammad Anis Musani, Dr Mohammad Arfeen, Dr Syed Hassan Abbas Naqvi and Dr Javeria Hameed worked on introduction and discussion. Dr Mehwish Nisar reviewed the literature, contributed to the discussion and edited the manuscript. Dr Arshi Imran and Dr Asad Ikram reviewed the literature, results and conclusion. All authors contributed to the final manuscript.

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