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PHILIPPINE SOCIETY OF PARENTERAL AND ENTERAL NUTRITION (PhilSPEN)

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TITLE: Comparison of Body Mass Index based nutritional status using WHO criteria versus “Asian” criteria: report from the Philippines

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ABSTRACT

OBJECTIVE: To determine which criteria to use for BMI based nutritional status – WHO (World Health Organization) versus “Asian” criteria – for nutrition screening of hospitalized patients in the Philippines.

RESEARCH METHODS AND PROCEDURES: Height in meters and weight in kilograms from two time periods were gathered (Phase 1: yrs 2000 to 2003 and Phase 2: yrs 2006 to 2007) with data from the Weight Center for comparison. BMI was computed and population distribution determined using WHO and “Asian” criteria. The collected values were plotted to form graphs using Microsoft Excel 2003 and analyzed. The criteria which produced the “normal distribution” pattern was considered the most appropriate criteria.

RESULTS: 140,612 patients from Phase 1 and 53,431 from Phase 2 were gathered with a male to female ratio of 1:1.5. From the Weight Center 584 patients were included. Distribution was not similar in Phase 1: Normal BMI (WHO=50% vs. Asian=31.3%), Overweight BMI (WHO=31.7% vs. Asian=18.7%), and in Pre-Obese BMI (Asian=31.9%). Phase 2 result was similar. The WHO criteria produced the normal “inverted bell” pattern while the Asian criteria showed a bimodal pattern with two peaks: the normal and pre-obese groups. In the Weight Center, the Asian criteria produced less Normal BMI (Asian=5% vs. WHO=11.8%) and less overweight patients (Asian=7% vs. WHO=27%) with a flattened initial curve in contrast to the WHO pattern.

CONCLUSION: The WHO based BMI classification of nutritional status reflected the “normal” distribution pattern compared to the “Asian” criteria and is the preferred criteria for use in nutrition screening in the Philippines.

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KEYWORDS: BMI; nutritional status; WHO criteria; “Asian” criteria

INTRODUCTION

The Body Mass Index (BMI) is widely used for the determination of nutritional status or body composition. [1,2] It is the value obtained when the weight in kilograms is divided by the square of the height in meters. Nutritional status is determined through BMI cut-offs values as recommended by the World Health Organization (WHO) (Table1) [2-4], however, in recent years some scientists in the Asia- Pacific region made recommendations that the criteria values be modified to fit the Asian body composition, which is claimed to be different compared to the American or European body composition. [5-8] (Table 1) Thus the “Asian criteria” for the determination of nutritional status based on the BMI was born. It was later adopted by several Asian countries including the Philippines.

In its goal of obtaining the easiest and fastest nutrition screening tool to use for nutrition surveillance in the hospital setting, the Clinical Nutrition Service of St. Luke’s Medical Center, Quezon City, Philippines, decided to use the BMI since it can be quickly determined from the height and weight of the admitted patient through a computer software and the whole process can provide a list of all normal, underweight, overweight, and obese patients within an hour or two after the data is gathered. [9] The issue of which criteria to use then came up, so in order to settle the differences of opinion, the nutrition team of the hospital decided to compare the WHO criteria against the Asian criteria based on anthropometric data already present in the data archives of the Clinical Nutrition Service and Weight Management Center. The goal of this study was to determine which of the two criteria produces the result that closely fits the pattern of a standard population using current statistical tools.

METHODOLOGY

All anthropometric data (height in meters and weight in kilograms) were extracted from the clinical nutrition database of St. Luke’s Medical Center, Quezon City, Philippines, which was a Microsoft Access© 2000 program, covering the period from years 2000 to 2003 (Phase 1) and the second period from the years 2006 to 2007 (Phase 2). For comparison purposes the database of the Weight Management Center was also included. These were then converted to BMI and grouped to their corresponding nutritional status using the WHO criteria and “Asian Criteria” (Table 1).

Table 1: Nutritional status based on the WHO and “Asian criteria” values		
Nutritional Status	WHO criteria BMI cut-off	“Asian criteria” BMI cut-off
Underweight	<18.5	<18.5
Normal	18.5 – 24.9	18.5 – 22.9
Overweight	25 – 29.9	23 – 24.9
Pre-Obese	-	25 – 29.9
Obese	≥30	≥30
Obese Type 1 (obese)	30 – 40	30 – 40
Obese Type 2 (morbid obese)	40.1 – 50	40.1 – 50
Obese Type 3 (super obese)	>50	>50

The collected values were plotted to form a graph using the Microsoft Excel© 2000 and the graph patterns of the years 2000 to 2003, years 2006 to 2007, and Weight Management Center were analyzed as to which of the two criteria comes up with the normal “bell shaped” curve or pattern depicting the “normal” population distribution [10]. A normal distribution of a given population has the following characteristics: an inverted “bell-shaped” pattern, symmetrical pattern for the 95% portion under the curve and 5% portion on both ends of the curve. If there is a preponderance of overweight/obese patients (or bigger values) compared to the underweights (or smaller values) i.e. the mean is greater than the median, the curve would be “skewed to the right” and if there were more underweight patients (or lesser values) compared to the overweight/obese (or bigger values) i.e. the mean is smaller than the median, then the curve would be “skewed to the left”. This pattern is reflective of an appropriate assignment of “cut- off” values. If the values show a pattern that is not of an inverted bell then it means the assigned “cut- off” values are not appropriate.

RESULTS

Patient profile: (Tables 2 to 4) A total of 140,612 patients were included for the WHO criteria analysis versus “Asia” criteria analysis for the whole hospital population for the years 2000 to 2003 (Phase 1) and a total of 53,431 patients were included for the years 2006 to 2007 (Phase 2). The male to female ratio for Phase 1 is 1:1.5, while that for Phase 2 is also 1:1.5. For the Weight Management Center a total of 584 patients were included with a male to female ratio of 1:1.3.

Nutritional status patterns based on WHO and Asian criteria: (Tables 2 to 4)

1. Year 2000 to 2003 (Phase 1): (Table 2) There were similar results for the underweight in both criteria (6.4%) and in the obese (11.7%). There were more normal patients in the WHO criteria (50.2% versus 31.3%) and more overweight patients (31.7% versus 18.7%). The pre-obese for the Asian criteria had no comparison in the WHO criteria (31.9%). Looking at the resulting graph, the WHO criteria values showed the inverted “bell-shaped” pattern which was skewed to the right, meaning there are more overweight/obese than underweight, while the Asian criteria values showed a bimodal graph pattern which is not reflective of normal “cut-off” values. (Figure 1)

Nutritional Status	WHO criteria	Number (%)	“Asian” criteria	Number (%)
Underweight	<18.5	8,999 (6.4)	<18.5	8,999 (6.4)
Normal	18.5 – 24.9	70,587 (50.2)	18.5 – 22.9	44,012 (31.3)
Overweight	25 – 29.9	44,574 (31.7)	23 – 24.9	26,294 (18.7)
Pre-Obese	-	-	25 – 29.9	44,855 (31.9)
Obese	≥30	16,452 (11.7)	≥30	16,452 (11.7)
Total		140,612		140,612

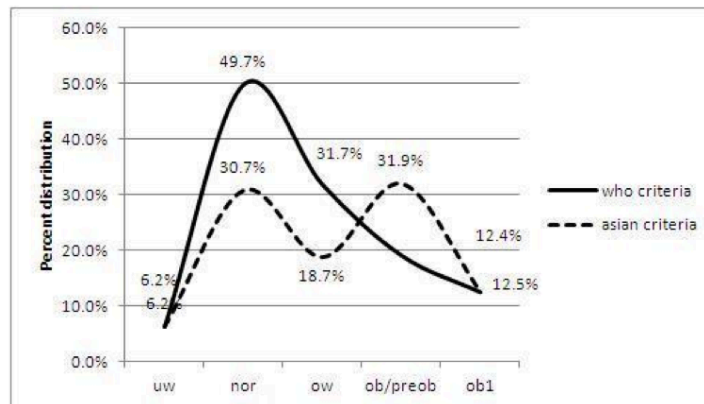


Figure 1: Data from St. Luke’s Medical Center Nutrition Database (yr2000 to 2003; n=140,612); Legend: uw=underweight, nor=normal, ow=overweight, preob=pre-obese, ob=obese, ob1=obese type 1

- Year 2006 to 2007 (Phase 2): (Table 3) The results and pattern in this group is identical with the year 2000-2003 data. The results from the WHO criteria in the underweight (6.2%) and obese (WHO=12.4%, “Asian”=12.5%) patient category are similar. The differences are in the normal group (WHO=49.7%; “Asian”=30.7%), overweight group (WHO=31.7%; Asian=18.7%), and in the pre-obese which showed 31.9% for the Asian criteria. The graph as shown in Figure 2 is identical to Figure 1.

Nutritional Status	WHO criteria	Number (%)	“Asian” criteria	Number (%)
Underweight	<18.5	3,313 (6.2)	<18.5	3,313 (6.2)
Normal	18.5 – 24.9	26,555 (49.7)	18.5 – 22.9	16,403 (30.7)
Overweight	25 – 29.9	16,938 (31.7)	23 – 24.9	9,992 (18.7)
Pre-Obese	-	-	25 – 29.9	17,045 (31.9)
Obese	≥30	6,625 (12.4)	≥30	6,678 (12.5)
Total		53,431		53,431

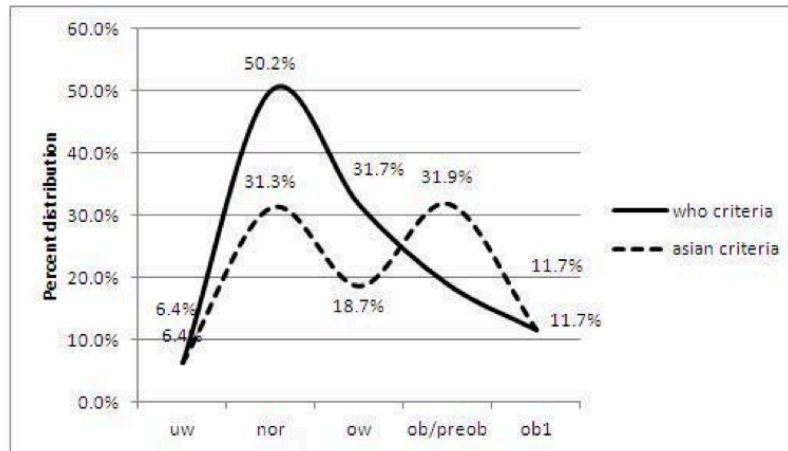


Figure 2: Data from St. Luke’s Medical Center Nutrition Database (yr2006 to 2007; n=53,431); Legend: uw=underweight, nor=normal, ow=overweight, preob=pre-obese, ob=obese, ob1=obese type 1

- Weight Management Center: The underweight and different types of obesity had similar results for both criteria, however, for the normal there were more patients in the WHO criteria (WHO=11.8% vs. Asian=5%) and also more patients in the overweight category (WHO=27% vs. “Asian”= 7%). (Table 4) The resulting graph showed a flatter curve for the normal and overweight cut-off values of the Asian criteria after which the curve pattern was similar for both. It also shows the curve to be skewed to the left, meaning there are more patients with lower BMI than higher BMI. (Figure 3)

Nutritional Status	WHO criteria	Number (%)	“Asian criteria”	Number (%)
Underweight	<18.5	8 (1.4)	<18.5	8 (1.4)
Normal	18.5 – 24.9	69 (11.8)	18 – 22.9	28 (5)
Overweight	25 – 29.9	158 (27)	23 – 24.9	41 (7)
Pre-Obese	-	-	25 – 29.9	158 (27)
Obese 1 (obese)	30 – 40	246 (42)	30 – 40	246 (42)
Obese 2 (morbid obese)	40.1 – 50	85 (14.6)	40.1 – 50	85 (14.6)
Obese 3 (super obese)	>50	18 (3.1)	>50	18 (3.1)
Total		584		584

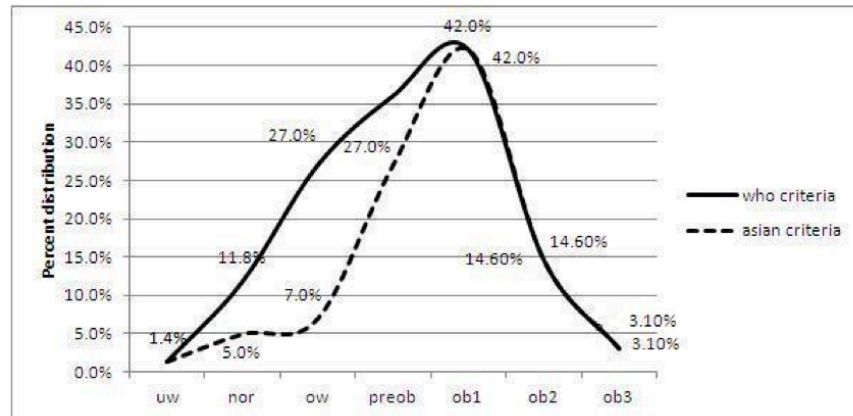


Figure 3: Data from the Weight Management Center, St. Luke’s Medical Center (n=584); Legend: uw=underweight, nor=normal, ow=overweight, preob=pre-obese, ob1=obese type 1 / obese, ob2=obese type 2 / morbid obese, ob3=obese type 3 / super obese

DISCUSSION

Statistical tools are able to show the normal pattern of a distribution of values when the assigned “cut- off” values are appropriate. However, when the values are not properly assigned, the distribution becomes “abnormally” shaped as shown here by the “Asian criteria” values. The bimodal pattern that came out is the result of reassigning values for the normal nutritional status which tried to “adjust” for the so-called smaller body composition for Asians and at the same time reducing the “cut-off” values for the overweight status. Thus the output showed two peaks – one for the normal nutritional status group and another for the pre-obese group – patterns which were not present in the WHO criteria assigned values. (Figures 1 and 2) Over-all there were less patients with normal BMI and more patients with overweight BMI when using the “Asian” criteria. On the other end of the spectrum the patients in the Weight Management Center who were mostly overweight to obese paradoxically showed lesser normal and overweight status patients when using the “Asian” criteria resulting to a flatter curve in the normal and overweight sectors after which the normal pattern in the obesity sectors followed (Figure 3). These visual analyses together with the resulting values demonstrate the appropriateness of the cut-off values of the WHO criteria in the hospital population of St. Luke’s Medical Center, Philippines compared to the “Asian” criteria. The consistency of results from the database of the two time periods (years 2000 to 2003 and years 2006 to 2007) further underscores the appropriateness of the WHO criteria for nutrition screening of admitted patients in this institution.

The “Asian” criteria then cannot be used for a BMI-based nutrition screening process for body composition in as much as it will show an artificial low prevalence of normal nutritional status patients and an artificial high prevalence of overweight patients. A report which compared the WHO modified criteria for Indians also showed a high 75% prevalence of overweight which was interpreted as an under-diagnosis of overweight/obese patients. [11] This may actually be an over-calculation due to the reassigned cut-off values. The reassinging of BMI cut off values in Japan were arbitrary and done to fit their observation that the WHO classification under-

reported on the incidence of overweight/obesity. [5] However, there was still a need to further evaluate their recommendations locally. They gave their recommendations for change in the Asia-Oceania Region and WHO Western Pacific Region and a follow up survey was reported in 2003 which again pushed for the recommended BMI cut-off value changes which were now termed "Asian" criteria. [6]

This study is a response to the call of the WHO expert consultation report in 2004 where the recommendation was to retain the original cut-off values since available data do not necessarily indicate a clear BMI cut-off point for all Asians for overweight or obesity. No attempt was made, therefore, to redefine cut-off points for each population separately. [12]

CONCLUSION

The WHO based BMI classification of nutritional status reflects the expected pattern of a normal population compared to the "Asian" criteria and is therefore the recommended criteria for use in the nutrition screening of admitted patients in the hospital in the Philippines.

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