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Association of Body Mass Index with Medical Care Use and Costs - Cerebrovascular Diseases, Ischemic Heart Disease, Hypertension and Diabetes Mellitus –

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ABSTRACT

The purpose of this study was to investigate the association of obesity with medical care use and costs according to overall diseases, cerebrovascular diseases (CVD), ischemic heart disease (IHD), hypertension (HTN) and diabetes mellitus (DM). The final sample was a group of persons who were free of diseases mentioned above and were not underweight. Their baseline screening program data and health insurance contribution data were connected with a 7-year medical claim database. The participants were classified according to their baseline BMI into normal, overweight, obese, and severely obese groups. Given the disease type, the total costs of DM showed the largest difference in each obesity group in both males and females. Also, the pharmacy costs for DM were more relevant than any other type of service to the obesity level. Considering the high prevalence of obesity and the relevantly increased medical care use and costs, there is a need for reduction in medical costs through obesity prevention efforts.

Key words: *Obesity, Body Mass Index, Medical Care Use, Medical Costs.*

1. INTRODUCTION

Obesity has been prevalent around the world. According to the World Health Organization (WHO), there were more than 1.4 billion overweight (BMI≥25) adults aged 20 and above and at least 500 million adults were obese (BMI≥30) worldwide in 2008 [1]. In Korea, adult obesity (BMI≥25) has increased by 4.8% from 26.0% in 1998 to 30.8% in 2010 [2].

Obesity is a common health problem which is considered a disease in itself and also a major risk factor to a number of other diseases, including cardiovascular diseases, non-insulin dependent diabetes, certain cancers, gallbladder disease and hypertension [3]. Oster G. et al summed up the risk by sex, eight obesity-related diseases and the BMI level using articles on major obesity-related epidemiologic researches in the U.S., and the disease with the highest relative risk in obese persons (BMI≥29) compared with normal ones was type II diabetes in both males and females; 10.4 and 48.9 respectively [4].

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It is associated with reduced longevity and has resulted in increased health care use and expenditures. Obesity accounts for 6% to 10% of health care expenditures in the U.S., 2.0% to 3.5% in other western countries and 3.1% in Japan. In Korea, the socioeconomic costs of obesity were 0.91% to 1.88% of total health care costs [5].

Yet, researches analyzing BMI and health and medical costs till now have been carried out mostly in the west, and the methods were based on studies assuming the costs in an obese group, not from individual patients by applying population-attributable risks to medical service costs for obesity-related disorders [6]-[10]. In addition, since the studies using real patients and real data present only the overall differences in medical costs according to obesity level, the relevance between obesity and each disease is lacking [11]-[13]. However, the relevance between BMI and coronary artery disease, hypertension and diabetes has been presented as the main reason for the increase of the entire medical care use and medical costs [14].

Thus, this study will trace the actual data of medical care use and costs for 7 years and compare their correlations with the medical care use, medical costs and the degree of obesity respectively for four obesity-related diseases with a great burden of disease, including cerebrovascular diseases (CVD),

ischemic heart disease (IHD), hypertension (HTN), and diabetes mellitus (DM).

2. METHODS

2.1 Study Subjects

The subjects for this study were 4,643,879 individuals who received physical health screening provided by National Health Insurance Corporation (NHIC) in 2001. To identify correlation between obesity and medical expenditure, individuals whose BMI is lower than 18.5 (n=181,342), or individuals previously diagnosed with CVD, IHD, HTN, DM, or suspected of having these disease (n=1,244,834) are excluded. In total, 3,217,703 study subjects (Male= 2,088,249, Female= 1,129,454) were included in our study.

2.2 Data Sources

The baseline (year 2001) screening program data and health insurance contribution data were connected with medical claim database from 2002 to 2008. The health screening data include sex, age, height, weight, blood pressure, blood glucose level, total cholesterol level, smoking and drinking habits. The health insurance status and insurance contribution data include health insurance types, household income (monthly health insurance contribution), and resident area. The medical claim database includes medical care use and costs.

2.3 Data Variables

A retrospective cohort study was conducted for a seven year period from 2002 to 2008 to examine the correlation between obesity and both medical care use and costs. In this study, outcome variables were annual average medical care use and costs per person categorized in inpatient, outpatient, and pharmacy including CVD, IHD, HTN, and DM based on health claim data from 2002 to 2008. Our study included individuals who had insurance claims at least twice with the above diagnosis.

The independent variable was the Body Mass Index (BMI, kg/m^2), one of obesity indicators which is calculated using height and weight data of subjects: subjects' heights and weights were obtained from physical examination. Study subjects were classified into the BMI categories, based on the guidelines of the Korean Society For the Study of Obesity (KSSO): 18.5-22.9 kg/m^2 (normal), 23.0-24.9 kg/m^2 (overweight), 25.0-29.9 kg/m^2 (obese), $\geq$30.0kg/m^2 (severely obese).

Adjustment factors in this study were age in years (based on 2001 data, continuous variable), total cholesterol level (mg/dl, <200, 200-239, ≥240), smoking status (never-smoker, ex-smoker, or current smoker), drinking status (non-drinker or current drinker), and income (assessed in December 2001 by monthly insurance contribution stratified employee insured and self-employed, respectively; Quartile1<25%, 25%≤Quartile2<50%, 50%≤Quartile3<75%, Quartile4≥75%).

2.4 Statistical Analysis

Descriptive statistics were used to analyze the subjects' socio-demographics, clinical characteristics, and health behavior by gender. The study used the generalized linear modeling (GLM) to compare annual medical care use and costs per person from 2002 to 2008 from four obesity-related diseases and each obesity-related disease including CVD, IHD, HTN, and DM by gender and BMI strata. The medical care use and costs were categorized into inpatient, outpatient and pharmacy, adjusted on age, total cholesterol level, smoking status, alcohol consumption, and income level. The annual medical cost was estimated based on the nominal price regardless of inflation. A posthoc least significant difference (LSD) test was conducted to compare differences between each of the 3 BMI strata (overweight, obese, severely obese) from the normal weight group. We analyzed data using the statistical analysis software (SAS) 9.1 version. The data is regarded as statistically significant when p-value is less than 0.05.

3. RESULTS

3.1 Subjects' General Characteristics

The general characteristics of the participants at the time of medical checkup (baseline) in 2001 are shown as Table 1. The average age was 39 years old in the males, while 41.3 in the females, which shows that the age of the females was a little higher. The average BMI in the basal survey was 23.5 in the males (standard deviation: 2.8), while 22.9 in the females (standard deviation: 2.9). The prevalence rate of overweight (26.9%) and obesity (27.5%) in the males was 54.3%, while that of overweight (21.9%) and obesity (20.8%) in the females was 42.7%, which was lower than that in the males. The proportion of large cities in residential area was at 56.7% and 54.2%, respectively in the males and females, while rural areas just at 7.1% and 10.4% in the males and females. Most of the males and females were employees insured at 82.7% and 72.6% respectively. Regarding blood pressure, the males had prehypertension at a considerably high rate of 70.9%, while the females at a lower rate of 51.9%. Their fasting blood sugar level was mostly normal, <100 (mg/dl) at 81.1% and 84.8% in the males and females respectively.

Table 1. The characteristics of the study subjects in baseline (2001) BMI

(Unit: n, %)

	Male (n=2,088,249)		Female (n=1,129,454)	
Age (years) Mean±SD	39.0±10.8		41.3±13.6	
Area of residence				
Large city	1,179,636	(56.7)	609,073	(54.2)
Medium/Small city	755,226	(36.3)	398,645	(35.5)
Rural area	147,628	(7.1)	116,951	(10.4)
Type of health insurance				
Self-Employed Insured	362,205	(17.3)	310,089	(27.5)
Employee Insured	1,726,044	(82.7)	819,365	(72.6)
Monthly health insurance contribution level				
Quartile1	522,139	(25.0)	225,623	(24.8)
Quartile2	521,032	(25.0)	230,779	(25.3)
Quartile3	525,865	(25.2)	223,457	(24.5)
Quartile4	519,213	(24.9)	231,195	(25.4)
BMI (kg/m^2)				
Normal (18.5-22.9)	954,186	(45.7)	647,431	(57.3)
Overweight (23.0-24.9)	560,706	(26.9)	247,418	(21.9)
Obese (25.0-29.9)	540,004	(25.9)	214,500	(19.0)
Severely obese (≥30.0)	33,353	(1.6)	20,105	(1.8)
Mean±SD	23.5±2.8		22.9±2.9	
Blood pressure (mmHg)				
Normotension (<120 and <80)	606,996	(29.1)	543,425	(48.1)
Pre-hypertension (120-139/80-89)	1,481,253	(70.9)	586,029	(51.9)
Fasting blood sugar (mg/ dl)				
<100	1,686,550	(81.1)	954,680	(84.8)
100-125	392,273	(18.9)	171,395	(15.2)
Total cholesterol (mg/ dl)				
<200	1,347,089	(64.5)	743,272	(65.8)
200-239	569,627	(27.3)	289,955	(25.7)
≥240	171,533	(8.2)	96,227	(8.5)
Smoking state				
Non-smoker	443,634	(30.7)	741,019	(94.4)
Ex-smoker	171,907	(11.9)	15,739	(2.0)
Current smoker	828,689	(57.4)	28,156	(3.6)
Drinking state				
Non-drinker	454,626	(30.8)	659,281	(69.6)
Current drinker	1,022,622	(69.2)	288,058	(30.4)

3.2 Annual Average Medical Care Use per Person

The annual average medical care use per person by sex depending on the degree of obesity for 7 years from 2002 to 2008 was shown as Table 2. First, the days of inpatient of overall diseases in the males were 1.05 times higher in the obese group, and 1.65 times higher in the severely obese group compared to the normal group, while the relevance was relatively less in the females, and when considered by the diseases, the greatest difference was shown in the days of inpatient due to DM in the obese group in both males and females (p<.0001).

The days of outpatient and pharmacy of overall diseases increased both in the males and females as the degree of obesity increased, and the days of pharmacy had the greatest relevance to the degree of obesity (p<.0001). According to the disease, the days of outpatient and pharmacy had a similar relevance pattern to the degree of obesity. Regarding the days of outpatient and pharmacy, there was the greatest difference in DM for both males and females in the obese group, followed by HTN and IHD, while CVD had less relevance. The days of pharmacy due to DM showing the greatest difference in both sexes by the obese group was 1.8 times higher in the overweight group, 3.3 times in the obese group and 7.3 times in the severely obese group in the males compared to the normal group (0.509 days), while it was 1.6 times, 3.2 times and 6.4 times higher respectively in the females compared to the normal group (0.486 days) (p<.0001).

Table 2. Average annual medical care use per person from 2002-2008 by baseline (2001) BMI

(Unit: days)

		Male			Female		
		Inpatient	Outpatient	Pharmacy	Inpatient	Outpatient	Pharmacy
Total	18.5-22.9	0.057	0.291	4.190	0.075	0.451	5.837
	23.0-24.9	0.054	0.414 ‖	6.338 ‖	0.050 ‖	0.572 ‖	8.156 ‖
	25.0-29.9	0.060 ‖	0.594 ‖	9.160 ‖	0.065 ‖	0.858 ‖	11.980 ‖
	≥30.0	0.094 ‖	0.887 ‖	13.475 ‖	0.065 ‖	1.305 ‖	17.446 ‖
Cerebrovascular diseases	18.5-22.9	0.038	0.031	0.453	0.057	0.046	0.639
	23.0-24.9	0.032	0.030 ‖	0.466 ‖	0.034 ‖	0.040 ‖	0.566 ‖
	25.0-29.9	0.029 ‖	0.032 ‖	0.502 ‖	0.042 ‖	0.046 ‖	0.670 ‖
	≥30.0	0.041	0.036	0.512	0.026	0.055 ‖	0.713 ‖
Ischemic heart disease	18.5-22.9	0.008	0.024	0.502	0.006	0.025	0.431
	23.0-24.9	0.009 ‖	0.027 ‖	0.626 ‖	0.005 ‖	0.028 ‖	0.520 ‖
	25.0-29.9	0.011 ‖	0.032 ‖	0.700 ‖	0.006 ‖	0.036 ‖	0.629 ‖
	≥30.0	0.011 ‖	0.037 ‖	0.792 ‖	0.009 ‖	0.046 ‖	0.791 ‖
Hypertension	18.5-22.9	0.006	0.192	2.726	0.009	0.331	4.292
	23.0-24.9	0.007	0.282 ‖	4.316 ‖	0.007 ‖	0.432 ‖	6.294 ‖
	25.0-29.9	0.009 ‖	0.399 ‖	6.271 ‖	0.008 ‖	0.637 ‖	9.120 ‖
	≥30.0	0.014 ‖	0.549 ‖	8.436 ‖	0.017 ‖	0.923 ‖	12.817 ‖
Diabetes Mellitus	18.5-22.9	0.005	0.044	0.509	0.003	0.049	0.486
	23.0-24.9	0.006 ‖	0.074 ‖	0.930 ‖	0.004 ‖	0.071 ‖	0.776 ‖
	25.0-29.9	0.011 ‖	0.131 ‖	1.688 ‖	0.009 ‖	0.139 ‖	1.561 ‖
	≥30.0	0.027 ‖	0.265 ‖	3.734 ‖	0.013 ‖	0.281 ‖	3.126 ‖

Adjusted for baseline age (year), baseline monthly income (health insurance contribution levels), baseline total cholesterol levels (mg/dl, <200, 200-239, ≥240), baseline smoking state (non-smoker, ex-smoker, current smoker) and baseline drinking state (non-drinker, current drinker)

‖ P<.05 for comparisons with the normal group (BMI 18.5-22.9)

3.3 Annual average medical costs per person for BMI

Table 3 shows the annual average medical costs per person for each group of BMI by gender for a seven year period from 2002 to 2008. There was a correlation between obesity and the total medical costs in four obesity-related diseases. The total medical costs (both males and females) increased according to the increase of degree of BMI (p<.0001). Relative to the normal group (21.3 US$ for male; 25.5 US$ for female), male subjects with overweight, obese, and severely obese showed 1.2, 1.6, 2.4 times; female showed 1.1, 1.5, 2.1 times higher total medical costs, respectively (p<.0001). As for obesity-related diseases, DM showed the greatest difference in total medical costs with BMI in both males and females; Compared to subjects with normal weight (1.7 US$ for male; 1.7 US$ for female), the cost was 1.6, 2.9, 7.1 times higher in male subjects and 1.4, 2.9, 5.8 times higher in female subjects in the group of overweight, obese and severely obese, respectively.

The inpatient costs of 4 obesity-related diseases slightly increased with BMI in the male group, while no significant association was found in the female group. As for obesity-related diseases, there was a significant increase of inpatient costs of DM and IHD across BMI strata in the male group; relative to those with normal weight (0.2 US$), the cost of diagnosed DM was 1.9 and 6.3 times higher among those with obese and severely obese, respectively. There were increases of 1.2, 1.5 and 1.6 times in the costs due to IHD in the groups of overweight, obese, and severely obese, respectively (p<.0001) relative to the normal group (4.1 US$). Among female subjects, there was a significant increase of inpatient costs for DM in those with obese and severely obese, 2.3 and 3.5 times higher respectively (p<.0001) relative to those with normal weight (0.2 US$).

The outpatient costs for the 4 obesity-related diseases increased with the degree of BMI in both males and females (p<.0001); 1.4, 2.0, 3.2 times higher outpatient costs for males and 1.2, 1.7, 2.6 times higher for females in the overweight, obese, and severely obese group, respectively, relative to those with normal weight (4.3 US$ for male and 7.1 US$ for female). For each of obesity-related diseases, there were greatest differences in outpatient costs for DM across BMI strata both in men and women pooled; relative to those with normal BMI in males (0.7 US$) and females (0.8 US$), the outpatient cost was 1.7, 2.9, 6.2 times higher in men and 1.5, 2.8, 5.5 times higher in women for those with overweight, obese, and severely obese (p<.0001).

The pharmacy costs for the 4 obesity-related diseases increased with BMI both in the male and female groups (p<.0001): in males, total pharmacy costs among individuals with overweight, obese, and severely obese was 1.4, 2.0, and 3.2 times higher than individuals with normal weight (7.1 US$); in females, the costs for overweight, obese, and severely obese

group were 1.3, 1.9, and 3.0 times higher than the normal weight group who spent 8.9 US$ (p<.0001). As for each of obesity-related diseases, there were greatest differences in pharmacy costs for DM across BMI strata both in men and women pooled; relative to those with normal BMI in males (0.8 US$) and females (0.7 US$), total pharmacy cost was 1.7, 3.2, 8.0 times higher in men and 1.5, 3.2, 6.7 times higher in women for those with overweight, obese, and severely obese (p<.0001).

The total costs, outpatient costs and pharmacy costs differences with BMI for HTN ware less than for DM followed by IHD. There was no significant association between obesity and total costs, outpatient costs and pharmacy costs in the both male and female groups with diagnosed CVD.

Table 3. Average annual medical costs per person from 2002-2008 by baseline (2001) BMI

(Unit: US$)

		Male				Female			
		Total	Inpatient	Outpatient	Pharmacy	Total	Inpatient	Outpatient	Pharmacy
Total	18.5-22.9	21.3	9.3	4.3	7.1	25.5	9.5	7.1	8.9
	23.0-24.9	26.1 ‖	9.6 ‖	5.9 ‖	10.1 ‖	27.5 ‖	7.3 ‖	8.6 ‖	11.5 ‖
	25.0-29.9	34.3 ‖	10.7 ‖	8.5 ‖	14.5 ‖	38.8 ‖	9.0 ‖	12.4 ‖	17.4 ‖
	≥30.0	50.1 ‖	13.5 ‖	13.6 ‖	22.8 ‖	54.4 ‖	9.5 ‖	18.4 ‖	26.5 ‖
Cerebrovascular diseases	18.5-22.9	7.1	4.9	0.9	1.4	9.8	6.7	1.3	1.8
	23.0-24.9	6.6	4.3	0.9 ‖	1.4 ‖	7.7 ‖	5.0 ‖	1.2 ‖	1.5 ‖
	25.0-29.9	6.7	4.2	1.0 ‖	1.6 ‖	9.2 ‖	5.9 ‖	1.3 ‖	1.9 ‖
	≥30.0	8.5	5.7	1.1	1.7	9.0 ‖	5.3 ‖	1.5 ‖	2.2 ‖
Ischemic heart disease	18.5-22.9	6.1	4.1	0.6	1.3	3.8	2.2	0.7	0.9
	23.0-24.9	7.4 ‖	5.0 ‖	0.8 ‖	1.6 ‖	3.8 ‖	1.9 ‖	0.8 ‖	1.1 ‖
	25.0-29.9	8.8 ‖	6.0 ‖	0.9 ‖	1.9 ‖	4.8 ‖	2.5 ‖	1.0 ‖	1.4 ‖
	≥30.0	9.4 ‖	6.3 ‖	1.0 ‖	2.1 ‖	6.1 ‖	3.1 ‖	1.2 ‖	1.8 ‖
Hypertension	18.5-22.9	6.4	0.2	2.6	3.6	10.3	0.4	4.4	5.5
	23.0-24.9	9.4 ‖	0.2	3.6 ‖	5.7 ‖	13.5 ‖	0.2	5.5 ‖	7.8 ‖
	25.0-29.9	13.8 ‖	0.2	5.1 ‖	8.5 ‖	20.0 ‖	0.3 ‖	8.0 ‖	11.7 ‖
	≥30.0	20.2 ‖	0.3	7.3 ‖	12.7 ‖	29.7 ‖	0.5 ‖	11.6 ‖	17.6 ‖
Diabetes	18.5-22.9	1.7	0.2	0.7	0.8	1.7	0.2	0.8	0.7
	23.0-24.9	2.7 ‖	0.2	1.2 ‖	1.4 ‖	2.4 ‖	0.2 ‖	1.1 ‖	1.1 ‖
	25.0-29.9	5.0 ‖	0.4 ‖	2.1 ‖	2.5 ‖	4.8 ‖	0.4 ‖	2.1 ‖	2.4 ‖
	≥30.0	12.0 ‖	1.2 ‖	4.4 ‖	6.3 ‖	9.7 ‖	0.6 ‖	4.1 ‖	5.0 ‖

1 US$=1,155 korean won, at foreign exchange rate on 22 June 2016

Adjusted for baseline age (year), baseline monthly income (health insurance contribution levels), baseline total cholesterol levels (mg/dl, <200, 200-239, ≥240), baseline smoking state (non-smoker, ex-smoker, current smoker) and baseline drinking state (non-drinker, current drinker)

‖ P<.05 for comparisons with the normal group (BMI 18.5-22.9)

4. CONCLUSIONS

This study analyzed the correlation between obesity and medical care use and costs for obesity-related diseases including CVD, IHD, HTN, and DM. As for obesity-related diseases, both male and female subjects with DM had the greatest differences in outpatient and pharmacy visits across BMI followed by HTN, IHD, and no significant difference was found in those with CVD.

The annual average medical costs per person for obesity-related diseases slightly increased with BMI both in male and female subjects. The inpatient costs increased with BMI only in the male group, while the outpatient and pharmacy costs increased with BMI in the both male and female groups. Regarding specific diseases, the biggest difference by BMI was shown in DM followed by HTN and IHD. Martha LD et al reported that total annual medical costs and medical costs of coronary artery disease (CAD) and diabetes increased with higher baseline BMI, which is consistent with the findings in this study [15]. In addition, Wolf AM et al estimated that medical costs for CAD, HTN, and DM with BMI is 25.0~29.0 and BMI≥30.0 were 107.9% and 183.3% higher in CAD relative to those with BMI of 23.0 to 24.9; 107.9% and 183.3% higher in HTN; 119.7% and 537.2% higher, which is also similar with our findings [16].

This study shows that annual pharmacy costs per person related to DM in male subjects with overweight, obese, and severely obese were 1.7, 3.2, and 8.0 higher than those with normal weight; in terms of female subjects 1.5, 3.2, and 6.7, respectively. This finding is consistent with Thompson et al reporting that DM-related medication costs of individuals with BMI of 25.0 to 29.0 and with BMI≥30.0 were 3.38 and 13.25 times higher than those with BMI of 20.0 to 24.9 [11]. However, this study showed substantially low costs differences

in medical cost of obesity and DM, because, contrary to Thompson et al, this study excluded the subjects with medical history of DM and suspected of having DM at baseline in order to examine a correlation between obesity and medical costs, which may reduce its prevalence rate [10].

Some additional limitations and suggestions for future research are discussed below. First, in 2001, the nationwide screening rate was 41.5% and further investigation for a low socio-economic status population is necessary because this study may not fully represent total population of the insured as evidence by the low screening rate among the insured, particularly local residents. Second, the medical expenditure outcome variable was estimated based on the medical treatment expense data only, which was obtained from the NHIC medical claim, not considering copayment for insurance exclusions. Thus, the annual healthcare cost per capita may not reflect the actual expenditure, and the cost may have been underestimated. Third, the accuracy of diagnosis stated in the medical claim has been questioned because the health insurance data is collected not for a statistical analysis but for a medical claim that requires to be reviewed by Health Insurance Review and Assessment Service (HIRA) under the fee-for-service system. To improve the accuracy, the study included individuals whose medical claim contain at least twice with the diagnosis code of CVD, IHD, HTN, and DM in analyzing data. Fourth, there was no attempt to calculate inflation, indirect costs associated with the conditions such as loss of income/productivity associated with the obesity, etc. Further studies need to be followed. Finally, previous studies reported that obesity is an independent risk factor for HTN, DM, CVD but also interplays with other risk factors such as blood pressure, total cholesterol, and blood glucose. Thus, a long-term observation period is required to analyze the relationship between obesity and obesity-related diseases, which indicates the 7-year period of observation in this study may not sufficient. The observation period of previous longitudinal studies that analyzed the relationship between obesity and total healthcare service, medical cost, varies from as short as 3-years [12] to as long as over 10-years [15]. The length of observation period for HTN studies varies from as short as 2 to 3 years [17], [18] to as long as 12 years [19]. One of CVD studies collected longitudinal data throughout over 16 years. Pi-Sunyer FX reported that it is difficult to identify precisely the relationship between obesity and CVD with 5- to 10-year period of observation and recommended to extend the observation period [20].

Although numerous studies have examined the association between obesity and obesity-related diseases, there are not sufficient studies that investigated the increasing health service use and health care cost related to obesity. This study is important in terms of including a large population representing 3 million individuals who received health screening provided by NHIS, collecting data over a 7-year period which is relatively a long period of time, and utilizing reliable data from NHIS to estimate use of medical service and expenditure. Moreover, to increase the validity, BMI was calculated in consideration of weight and height data measured during health screening from medical personnel not using self-reported survey data.

In conclusion, this study's findings indicate that effective interventions to prevent obesity are inevitable. These results can be valuable data to be used to develop obesity prevention policy to promote health in Korea, reduce fast-growing healthcare cost attributed to DM and HTN, and reinvest the cost saving to further develop the obesity prevention policy.

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