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Original Research Article

Comparison of renal functions amongst obese and non-obese adults of rural population area of Northern India

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ABSTRACT

Introduction: Obesity has become the leading global health problem. In numerous large population-based studies-Higher BMI associated with presence and development of low estimated GFR and many other renal diseases.
Objective: To study the renal functions in obese adults of rural area.
To do comparative analysis of renal functions with age and sex matched non obese adults.
Material and Methods: The present cross-sectional study was carried out in the General Medicine OPD of BPS GMC for Women, Khanpur Kalan, Sonipat, Haryana. A sample of convenient 100 obese patients were taken. A total of 200 patients attending General Medicine OPD were taken, out of which 100 were obese and 100 were non obese.
Results: Statistically significant P values were obtained for Blood Urea, Serum Creatinine, Serum Calcium, Serum Phosphorus, and urine albumin among obese and non-obese adults. Study shows no significant gender differences between obese and non-obese. Statistical analysis shows some age-related differences among obese and non-obese large population studies-showing positive association of BMI with chronic kidney disease.

Keywords: Obesity, diabetes, hypertension, albuminuria, chronic kidney disease

Introduction

The increasing prevalence of obesity, especially in adults, is associated with the risk to develop kidney disease and the progression of renal disease [1, 2]. Emerging studies in this last decade indicate that, aside from being a major cause for the development of diabetes and hypertension, obesity may have direct adverse effects on kidney function independent of the other known risk factors [1, 3, 4]. Hormonal factors, oxidative stress, inflammation, and endothelial dysfunction could explain the link between obesity and CKD [5]. However, there is still a lack of knowledge about the prevalence and risk factors of obesity-related kidney disease. Classification of patients in CKD category but also, better dose adjustment of drugs eliminated correctly estimating renal function in obese patients is, thus, essential for not only

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the by the kidneys in these patients but also for the better adjustments of drugs that are eliminated.

The global prevalence of obesity and morbid obesity, which is commonly defined as a body mass index (BMI) over 30 and 40 kg/m2, respectively, is rapidly rising. In 2015, over 600 million adults were obese worldwide, accounting for 12% of the entire adult population [6]. Due to physiological changes associated with obesity, such as an increase in fat and other tissue, differences in liver size, liver flow, liver enzyme activity and glomerular filtration rate (GFR), obesity-related changes in pharmacokinetic (PK) and/or pharmacodynamic (PD) parameters of drugs may be expected [7]. In individuals affected by obesity, a (likely) compensatory mechanism of hyperfiltration occurs to meet the heightened metabolic demands of the increased body weight. The increase in intraglomerular pressure can damage the kidney structure and raise the risk of developing CKD in the long term. In numerous large population-based studies, higher BMI appears associated with the presence and development of low estimated glomerular filtration rate (GFR), with more rapid loss of estimated GFR over time, and with the incidence of ESRD [8, 9]. Elevated BMI levels, class II obesity and above, have been associated with more rapid progression of CKD in patients with pre-existing CKD. A few studies examining the association of abdominal obesity using WHR or WC with CKD, describe an association between higher girth and albuminuria [10] decreased GFR or incident ESRD independent of BMI level. Higher body weight is associated with lower urine pH and increased urinary oxalate, uric acid, sodium and phosphate excretion. Diets richer in protein and sodium may lead to a more acidic urine and decrease in urinary citrate, also contributing to kidney stone risk [11].

Aims & Objectives

The overall aims of the study were:

To study the renal functions in obese adults of rural area

To do comparative analysis of renal functions with age and sex matched non obese adults of rural area.

To compare the estimated GFR by MDRD equation with Cockcroft gault formula in obese patients.

To compare the results of this study with those of existing urban studies.

Material & Methods

This cross-sectional study was undertaken at the Department of Medicine in collaboration with department of Biochemistry at Bhagat Phool Singh Government Medical College, Khanpur Kalan, Haryana, from 1st June to 31st July 2019.

Study population and selection criteria

The study was conducted on the rural population falling in the catchment area of this hospital. A sample of convenient 100 obese patients attending General Medicine outdoor and indoor patient services was taken. The ethical clearance was taken from institutional ethical committee. Written informed consent for voluntary participation was taken from each patient. Confidentiality of patient data was maintained. Patients of ages 18-55 years, of either gender, with Body Mass Index (BMI) more than 30 (according to the revised Asia-Pacific BMI recommendations by WHO) [12] and willing to participate was included in the study, through purposive sampling.

Exclusion criteria

No exclusion criteria.

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Data collection procedures and instruments

The blood samples for renal functions, urine sample for albumin, and BMI was taken on first visit of obese and non-obese patients attending general medicine outdoor and indoor patient services. Estimation of glomerular filtration rate (GFR) was done as per MDRD equation and Cockcroft gault formula as per equations below [13, 14].

MDRD equation [13]: 186 x (Creatinine/88.4)-1.154 x (Age)-0.203 x (0.742 if female) x (1.210 if black).

Cockcroft Gault formula [14]: ([140-age] × weight in kg)/(serum creatinine × 72) x 0.85 for female.

Clinical parameters: Weight and height of the subjects was measured to the nearest 0.1 kgs and 0.5 cm respectively and BMI calculated using the formula weight (kg)/height (m) [2]. Waist and hip circumferences were measured using non-stretchable tape according to WHO guidelines [9]. Body fat percentage was estimated by using non-invasive digital body composition analyzer available in the central research laboratory of the institute.

Biochemical parameters: Blood urea, serum creatinine, serum calcium, serum Phosphorous, were estimated by Roche Modular P 800 automated clinical analyzer, for which 5 ml of venous sample was obtained on first visit of the patient to the hospital.

Quality control: Internal and external quality control of convenient samples was done as per standard operative procedures (SOPs) of the Department of Biochemistry.

Data analysis and interpretation: The collected data was entered in Excel spreadsheet. Mean and standard deviation was calculated for quantitative data. Percentages and proportions were calculated for qualitative data. Chi-square test was used for categorical variables. Pearson correlation was found out between BMI and serum creatinine, considering P value <0.05 as statistically significant. Correlation and regression models were compared for accuracy and precision.

Observation

Age wise distribution of study subject:

Age	Obese	Non-Obese	Total
20-30	12	28	40
31-40	29	24	53
41-50	25	29	54
>50	34	19	53
Total	100	100	200

Chi Square Value = 8.777; df = 3; P=0.032

Sex wise distribution of study subjects

Gender	Obese	Non-Obese	Total
Male	32	42	74
Female	68	58	126
Total	100	100	200

Chi Square value = 2.795; df = 1; P = 0.66

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Blood Urea

Blood Urea	Obese	Non-obese	Total
Normal	12(37.5%)	20(62.5%)	32
Variable	88(52.3%)	80(47.6%)	168
Total	100	100	200

Chi Square value = 5.766^a; df = 1; P = 0.16

Serum Creatinine

Serum creatinine	Obese	Non-Obese	Total
Normal	84	72	156
Variable	16	28	44
Total	100	100	200

Chi Square value = 7.059^a; df = 1; P = 0.007

Serum Calcium

Serum Calcium	Obese	Non-Obese	Total
Normal	85	76	161
Variable	15	24	39
Total	100	100	200

Chi Square value = 4.838^a; df = 1; P = 0.024

Serum Phosphorus

Serum phosphorus	Obese	Non-obese	Total
Normal	70	90	160
Variable	30	10	40
Total	100	100	200

Chi Square value = 22.857^a; df = 1; P = 0.00

Urine Albumin

Urine albumin	Obese	Non-obese	Total
Negative	85	89	174
Positive	15	11	26
Total	100	100	200

Chi Square value = 4.052^a; df = 1; P = 0.044

Discussion

This cross-sectional study was conducted on the rural population attending general medicine outdoor and indoor patient service at Bhagat Phool Singh Government Medical College for women Khanpur Kalan, Sonipat. This Study aimed to assess the comparison of renal function amongst obese and non-obese adults of age group 18-55 years. In our Study, statistically significant correlation was found with Serum Urea, Serum Creatinine, Serum Calcium, Serum Phosphorus and Urine Albumin between obese and non-obese adults. Analysis also suggests some age-related differences among obese and non-obese, i.e., 60.9% obese were > 50 years of years.

Aging has been shown to be associated with decline in Renal Function and higher age was associated with higher BMI. Study showing non statistically significant gender differences between obese and non-obese. Y Wang *et al*. in their study (2008) on "Association between Obesity and Kidney Disease" found out that-Results from cohort studies in patient population

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and cross sectional and case control studies all indicated a positive association between BMI and risk of kidney diseases outcomes. Anirban Ghosh *et al*. in their hospital-based case control Study also found similar findings. Our statistical analysis showing-Hemodynamic abnormalities among obese adults. 62.7% obese showing variable blood urea not in normal range. Statically significant P value were obtained for Blood urea, Serum Creatinine, Serum Calcium and Serum Phosphorus. Findings in our study was almost similar findings of JS Sandhu et al, who found significant correlation of BMI with Renal profile among obese individuals.

Conclusion

Obesity has become a leading global health problem. CKD risk in the obese are efficacious. There is urgent priority to set goals and means for risk modification. Obesity is certainly better prevented than treated. Thus, obese individuals are allowed to make some dietary and lifestyle modifications to reduce the burden of obesity related health hazards. It is necessary to spread awareness regarding links between obesity and kidney diseases and to find out optimal strategies. Approximate documentation of existing knowledge should be done in efficient manner to provide benefits of primary and secondary preventive intervention in obese individuals.

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