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ORIGINAL ARTICLE

Relationship Between High Sodium Chloride Intake and Obesity in Hypertensive Population A Cross-Sectional Study

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ABSTRACT

Background: High Sodium chloride intake and obesity are significant, regarding hypertension in the population which may develop several medical complications.

Objective: The aims and objectives of the current study were to introduce lifestyle medicine awareness in people for managing high blood pressure caused by high sodium chloride intake and obesity.

Study Design: It was a cross-sectional clinical Study of the management of high blood pressure in a population with the help of nutrition & physical exercise.

Place and Duration: The present study was conducted from January to May 2023 and Patients were selected from the community health center and Ghurky Hospital Lahore.

Methodology: ToA total of 10 of 0 hypertensive individuals were selected and divided into different groups regarding hypertension, obesity, sodium chloride intake in daily life, and other demographics. People were separated into different groups based on their sodium intake levels and BMI people were separated into different groups. In group- A there was 50 male and female while in group B other 50 male and female were included respectively.

Results: Significant (P≤0.05) changes in systolic and diastolic blood pressure were seen in the individuals of both groups regarding NaCl intake. The mean standard deviation levels, BMI, Systolic and Diastolic blood pressure of men in Group-A and Group-B in the beginning (27.03±0.02, 130.01±0.01, 90.01±0.02), (30.01±0.02, 135.01±0.01, 90.01±0.02) after 15 days (27.03±0.02, 125.01±0.01, 83.01±0.01), (30.01±0.02, 140.01±0.01, 90.01±0.02) and after30 days (27.03±0.02, 124.01±0.01, 80.01±0.01), (30.01±0.02, 145.01±0.01, 100.01±0.01) were measured respectively. Similarly the mean standard deviation levels, BMI, Systolic and Diastolic blood pressure of women in Group-A and Group B in the beginning (28.03±0.02, 131.01±0.01, 88.01±0.02), (31.02±0.02, 131.01±0.01, 88.01±0.02) after 15 days (28.03±0.02, 125.01±0.01, 83.01±0.01), (31.02±0.02, 140.01±0.01, 90.01±0.02) and after30 days (28.03±0.02, 120.01±0.01, 84.01±0.01), (31.02±0.02, 150.01±0.01, 92.01±0.01) were calculated.

Conclusion: All recommendations suggest limiting dietary salt as one of the tried-and-true ways to lower high blood pressure because there is a well-established link between excessive salt consumption and hypertension. A current study proved that high sodium chloride intake may increase blood pressure in humans.

Keywords: Hypertensive, Sodium Chloride, BMI, Systolic and Diastolic blood pressure.

INTRODUCTION

The average daily intake of sodium varies significantly all over the world, falling between 3.5 and 5.5 grams (9 to 12 grams of salt), with notable regional variations[1]. The World Health Organization advised limiting sodium intake to about 2.0 g per day, equivalent to about 5.0 g of salt per day, for the general population[2]. A special effort should be made to reduce salt intake for the hypertensive population, which includes more than a billion patients worldwide. The cardiovascular system benefits from a reduction in salt consumption, which lowers blood pressure in hypertensive individuals and may also improve vascular function and the viscoelastic qualities of the major arteries[3].

It is generally known that eating a lot of salt i.e. sodium chloride raises blood pressure and leads to cardiovascular disorders. Different studies concluded that 1 g of salt is equal to 0.4 g of sodium[4]. Recently, several lines of research have also demonstrated a link between high salt intake and an elevated risk of obesity. High salt intake induces thirst and increases fluid intake, which increases the consumption of sugar-sweetened beverages as a result of this connection[5]. It has been demonstrated that children and adolescents who consume 1 g/d more salt consume 27 g/d more sugar-sweetened soft drinks[6]. The excessive consumption of processed foods that are heavy in calories and salt may also contribute to the link between salt and obesity. Nevertheless, mounting data points to a possible direct connection between salt consumption and obesity independent of overall calorie intake[7].

The measurement of sodium discharged in twenty-four-hour urine is the "gold standard" for assessing dietary sodium (Na) intake[8]. Except for consuming more salt each day, poor potassium (K) intake negatively impacts arterial blood pressure. Compared to Na or K intake alone, the urine ratio of sodium to potassium (Na-to-K) is thought to be a more accurate predictor of the risk of CVD[9]. A healthy lifestyle is advised for the prevention and treatment of hypertension and cardiovascular disease (CVD), and this includes eating sodium and potassium in moderation each day. It has been demonstrated that high dietary sodium intake is linked to high blood pressure, while low sodium intake is linked to lower blood pressure in humans[10]. In adults, increased potassium intake is likewise linked to lower blood pressure and has a positive impact on blood pressure, but in children, there isn't much data to support this association[11].

Along with the high frequency of hypertension, obesity has emerged as a significant global public health issue. Overweight and its related metabolic problems are becoming more common in individuals and it was concluded that when body weight increases, blood pressure numbers change to greater levels[12]. Body mass index (BMI) and blood pressure are positively correlated in overweight adolescents, and obesity is associated with a high incidence of CV risk factors, including hypertension[13]. A high salt intake is linked to overweight and obesity in children and young people, according to studies on sodium consumption and its relationship to body weight. High salt consumption is the main contributor to high blood pressure, which in turn causes cardiovascular disorders. Recent research has demonstrated that consuming sugar-sweetened beverages increases the risk of obesity and is connected with high salt intake. Growing research also points to a clear connection[14].

MATERIALS AND METHODS

Study design: It was a cross-sectional clinical Study of the management of high blood pressure in a population with the help of nutrition & physical exercise.

Aims and objectives: The aims and objectives of the current study were to introduce lifestyle medicine awareness in people for

managing high blood pressure caused by high sodium chloride intake and obesity.

Sample collection method: A random Sampling Technique through questioner was applied for the collection of raw data. Hypertensive obese males and females were considered regarding their salt intake in daily life. Regular systolic, and diastolic blood pressure salt intake, and BMI levels were measured. Other demographics such as gender, age, smoking, alcohol intake, and physical activity were also observed in each group.

Inclusion criteria: The age was between 25 to 60 years of all participants. Diagnosis of hypertension, Control of hypertension, diet plan, and control of sodium-containing products were considered.

Exclusion criteria: Comorbidities related to pregnancy, breastfeeding, blood pressure, or weight status include renal diseases, medication, and use of missing Information.

METHODOLOGY

A total of 100 hypertensive individuals were selected and divided into different groups regarding hypertension, obesity, sodium chloride intake in daily life, and other demographics. People were separated into different groups based on their sodium intake levels and BMI. In group A there was 50 male and female while in group B other 50 male and female were included respectively.

Blood pressure measurements: Regardless of blood pressure readings, participants were deemed hypertensive if their average systolic or diastolic blood pressure was greater than 130 or 90 millimeters of mercury, respectively. At rest, while seated, and at 5-min intervals, blood pressure was measured using a Stabil-O-Graph SBPM, Control upper arm sphygmomanometer with an adjustable cuff

Parameters: Body mass index (BMI), physical exercise, and Systolic and Diastolic blood pressure of participants taking high quantities and normal amounts of sodium chloride in their daily food.

Bio-statistic: Raw data was bio-statistically operated by applying SPSS version 2022. Descriptive statistics Means, standard deviations, frequencies, and percentages of participant characteristics were determined and also applied t-test for associations between salt intake, obesity, and hypertension in the population respectively. Significant (P≤0.05) levels for Means, and standard deviations (Mean ± SD) were considered.

RESULTS

Table1: General Demographics of Group A, Male

Variables	Demographics	Mean ± SD	(P≤0.05)
Age	25-60 y	35.03±0.02	0.02
Smoking	Majority	15.04±0.01	0.01
Alcohol	Rare	3.12±0.04	0.04
Exercise	Low	6.10±0.01	0.01
Water intake	Normal	20.03±0.03	0.03
Family history	High	30.01±0.01	0.01

Table2: General Demographics of group A, Female

Variables	Demographics	Mean ± SD	(P≤0.05)
Age	25-60 y	35.03±0.02	0.02
Smoking	low	2.04±0.01	0.01
Alcohol	Non	0.0 ±0.00	0.00
Exercise	Low	6.10±0.01	0.01
Water intake	Normal	20.03±0.03	0.03
Family history	High	29.01±0.01	0.01

Table 3: Group A, male individuals taking low quantity of sodium chloride in their daily meal

Parameters	Units	Mean ± SD	(P≤0.05)
BMI	kg/m^2	27.03±0.02	0.02
Systolic BP	mm Hg	130.01±0.01	0.01
Diastolic BP	mm Hg	90.01±0.02	0.02
Systolic BP after 15 days	mm Hg	125.01±0.01	0.01
Diastolic BP after 15 days	mm Hg	83.01±0.01	0.01
Systolic BP after 30 days	mm Hg	124.01±0.01	0.01
Diastolic BP after 30 days	mm Hg	80.01±0.01	0.01

Table 4: Group A, Female individuals taking low quantity of sodium chloride in their daily meal

Parameters	Units	Mean ± SD	(P≤0.05)
BMI	kg/m^2	28.03±0.02	0.02
Systolic BP	mm Hg	131.01±0.01	0.01
Diastolic BP	mm Hg	88.01±0.02	0.02
Systolic BP after 15 days	mm Hg	125.01±0.01	0.01
Diastolic BP after 15 days	mm Hg	83.01±0.01	0.01
Systolic BP after 30 days	mm Hg	120.01±0.01	0.01
Diastolic BP after 30 days	mm Hg	84.01±0.01	0.01

Table5: General Demographics of group A, male

Variables	Demographics	Mean ± SD	(P≤0.05)
Age	25-60 y	35.03±0.02	0.02
Smoking	low	3.04±0.01	0.01
Alcohol	Non	0.0 ±0.00	0.00
Exercise	Low	4.10±0.01	0.01
Water intake	Low	30.03±0.03	0.03
Family history	High	29.01±0.01	0.01

Table6: General Demographics of group A, Female

Variables	Demographics	Mean ± SD	(P≤0.05)
Age	25-60 y	35.03±0.02	0.02
Smoking	low	2.04±0.01	0.01
Alcohol	Non	0.0 ±0.00	0.00
Exercise	Low	6.10±0.01	0.01
Water intake	Normal	20.03±0.03	0.03
Family history	High	29.01±0.01	0.01

Table7: Group A, male individuals taking high quantity of sodium chloride in their daily meal

Parameters	Units	Mean ± SD	(P≤0.05)
BMI	kg/m^2	30.01±0.02	0.02
Systolic BP	mm Hg	135.01±0.01	0.01
Diastolic BP	mm Hg	90.01±0.02	0.02
Systolic BP after 15 days	mm Hg	140.01±0.01	0.01
Diastolic BP after 15 days	mm Hg	90.01±0.02	0.02
Systolic BP after 30 days	mm Hg	145.01±0.01	0.01
Diastolic BP after 30 days	mm Hg	100.01±0.01	0.01

Table 8: Group A, Female individuals taking high quantity of sodium chloride in their daily meal

Parameters	Units	Mean ± SD	(P≤0.05)
BMI	kg/m^2	31.02±0.02	0.02
Systolic BP	mm Hg	131.01±0.01	0.01
Diastolic BP	mm Hg	88.01±0.02	0.02
Systolic BP after 15 days	mm Hg	140.01±0.01	0.02
Diastolic BP after 15 days	mm Hg	90.01±0.02	0.02
Systolic BP after 30 days	mm Hg	150.01±0.01	0.01
Diastolic BP after 30 days	mm Hg	92.01±0.01	0.01

A significant (P≤0.05) changes in systolic and diastolic blood pressure were seen in the individuals of both groups regarding NaCl intake. The higher life threatening demographics like smoking and alcohol also created excitation in blood pressure of population. The mean standard deviation levels, BMI, Systolic and Diastolic blood pressure of men in Group-A and Group-B in beginning (27.03±0.02, 130.01±0.01, 90.01±0.02), (30.01±0.02, 135.01±0.01, 90.01±0.02) after 15 days (27.03±0.02, 125.01±0.01, 83.01±0.01), (30.01±0.02, 140.01±0.01, 90.01±0.02) and after30 days (27.03±0.02, 124.01±0.01, 80.01±0.01), (30.01±0.02, 145.01±0.01, 100.01±0.01) were measured respectively. Similarly the mean standard deviation levels, BMI, Systolic and Diastolic blood pressure of women in Group-A and Group-B in beginning (28.03±0.02, 131.01±0.01, 88.01±0.02), (31.02±0.02, 131.01±0.01, 88.01±0.02) after 15 days (28.03±0.02, 125.01±0.01, 83.01±0.01), (31.02±0.02, 140.01±0.01, 90.01±0.02) and after30 days (28.03±0.02, 120.01±0.01, 84.01±0.01), (31.02±0.02, 150.01±0.01, 92.01±0.01) were calculated. Other demographics also showed a remarkable effects on blood pressure.

The most important white killers are sugar and salt, respectively. Different researchers proved in their researches that excessive salt consumption is a cause of high blood pressure

which has negative effects on the heart functioning. Current study showed that high intake of sodium chloride directly proportional to the blood pressure and a significant (P≤0.05) changes were seen in the individuals of Group-B as compared with the individuals of Group-A respectively. Salt, sometimes known as table salt, is a chemical substance made up of sodium and chloride; sodium and salt are not the same thing. Although these two terms are frequently used interchangeably, it is crucial to understand the distinction since sodium and salt have different daily intake recommendations.

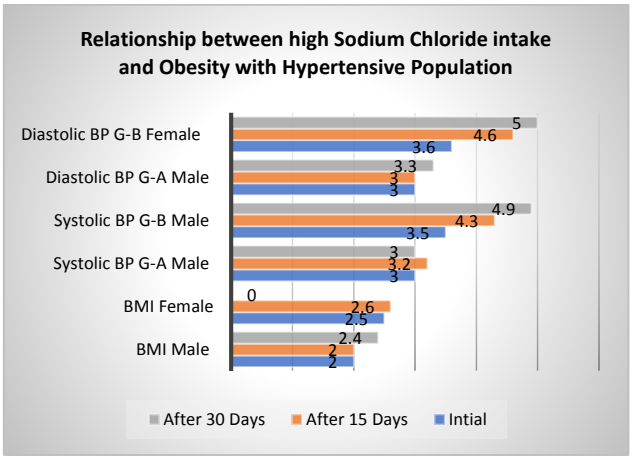

Fig-1: Relationship between high Sodium Chloride intake and Obesity with Hypertensive Population

Graphical presentation of BMI, Systolic and Diastolic blood pressure of Group-A and Group-B individuals is shown in fig-1 thoroughly. Males consumed more salt on average each day than females did, although the difference was not statistically significant. With age, salt consumption increased significantly (p≤ 0.05). The hypertension participants' mean daily salt intake was substantially higher than that of the normotensive people.

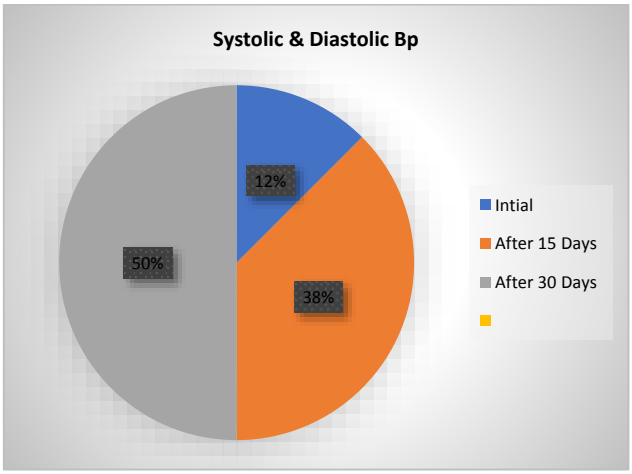

Fig-2: Systolic and Diastolic blood pressure of Group-A and Group-B individuals

DISCUSSION

The current study was conducted in the winter, and considering Pakistan's eating patterns and the consumption of preserved goods, the seasonally increasing salt intake is possible. The randomized sample size used in this study, which represents the entire population, was one of its benefits[15]. Body mass index (BMI) was used to determine obesity in adolescents, and age- and sex specific cutoff values were used to assess weight status[16]. Dietitians used a food frequency questionnaire to conduct interviews with each subject to learn about their typical daily salt intake. Together with chloride, sodium is essential for many cellular processes and determines the extracellular fluid's osmolality[17]. Additionally, sodium plays a crucial role in maintaining the balance between the acids and bases in the body as well as the release of various digestive enzymes[18].

The World Health Organization defines an excessive consumption of sodium as more than 2 gm of sodium or more than 5 gm of sodium chloride per day[19]. It has been discovered that the higher the daily salt intake, the higher the systolic blood pressure. Furthermore, in ambulatory blood pressure monitoring, increased salt intake was observed to reduce the natural nocturnal blood pressure lowering and to raise the daytime heart rate[20]. It has been demonstrated that salt restriction can lower blood pressure; in one study, a daily sodium intake reduction of 1.75 gm or 4.4 gm of sodium chloride was linked to a mean drop in systolic and diastolic blood pressure of 125/ 81 mm of mercury, respectively[21].

Although numerous studies have suggested that limiting salt intake to moderate levels lowers the risk of cardiovascular events, prospective randomized controlled trials have not yet offered conclusive evidence regarding the ideal sodium intake to reduced cardiovascular events and death[22]. A recent meta-analysis revealed that the best antihypertensive medications for lowering blood pressure in salt-sensitive people were calcium channel blockers and hydrochlorothiazide[23]. Effective salt restriction could help treated hypertension individuals take fewer or lower dosages

of antihypertensive medicines. International Society of Hypertension in 2020 The Global Hypertension Practice Guidelines advise consuming fewer salty foods, such as fast food, soy sauce, and processed meals, as well as lowering the amount of salt used in cooking and at the table[24, 25].

In Pakistan, a significant amount of salt usage was found. A connection between salt intake and mean systolic and diastolic blood pressure has been clearly shown in this population-based epidemiological field investigation[26]. The reduction in salt consumption must be viewed as a global health policy in the management of hypertension if a 3-gm reduction in daily salt consumption should have similar cardiovascular disease risk benefits to quitting smoking and should result in a reduction of 50 billion dollars annually in the economic burden of hypertension[27]. The important predictors of both systolic and diastolic blood pressure were sex, age, BMI, and place of residence. In line with other research, BMI was associated with both systolic and diastolic blood pressure[28].

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