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IODIZED SALT CONSUMPTION AND ITS ASSOCIATION WITH BLOOD PRESSURE AMONG WOMEN

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ABSTRACT

Iodine deficiency disorder (IDD) is one of the major disorders in under developed countries. Despite of various interventions, including universal salt iodization, IDD is significantly persistent which might be due to inadequate knowledge, poor attitude, and practice of iodized salt consumption. This study was conducted to determine the knowledge, attitude and practices of community regarding iodized salt consumption and its association with blood pressure among women residing in karma city. This was a cross-sectional study with the sample size of 300 households which was randomly selected and was divided into iodized and non-iodized salt consuming groups. A pre-designed questionnaire was used to determine the knowledge, attitude and practice toward iodized salt consumption. Rapid test kit was used to measure the iodine concentration in household salt samples. Digital blood pressure apparatus was used to measure the systolic and diastolic pressure of respondents. The data was consisted of socio demographic, educational status, anthropometric parameters, blood pressure and knowledge, attitude and practice about iodized salt consumption. This study result shows that the majority female's educational status was intermediate and above. Iodized salt consumption was significantly correlated with knowledge, attitude and practices ($p<0.05$) of the respondents. A highly significant ($p<0.001$) correlation was recorded for the educational status in relation to knowledge about iodized salt. The respondent's educational profile was also significantly ($p<0.05$) correlated with positive attitude and practice. Systolic and diastolic blood pressure was also significant correlated ($p<0.05$) with iodized salt consumption. This study concluded that mass media awareness is required regarding the iodized salt consumption. In addition, monitoring of the field for ensuring iodization of salt is also important.

Keywords: *Knowledge, Attitude, Practice, Iodized Salt, Iodine Deficiency, Goiter, Blood Pressure.*

INTRODUCTION

Iodine is most significant mineral necessary for the improvement and growth of the Infants, fetus, and children for appropriate mental and physical activities of adults (WHO, 2008).Nevertheless the Iodine helps to thyroid

gland for producing Thyroid hormones that is important for central nervous system and brain development(De Benoistet al., 2004). The inadequacy of Iodine Level may affect to the Hormones production that may affect to the body parts commonly, is known as "Iodine Deficiency Disease" (IDD), and these may consist of thyroid dysfunction, intellectual impairments, high risk of losing pregnancy, cretinism and mortality of newborn. However, it belongs among the most prevalent reversible factors of cognitive impairment (WHO 2007, Zimmermann and Boelaert, 2015).

In developing nations iodine deficiency disorders (IDA) are the perhaps the main general health problems (Wisnu, 2008). Moreover, inadequate consumption of iodine and improper storage of iodine may cause goiter, psychological growth disorders, spontaneous and muscular dystrophy. These cases are found among infant baby while there was deficiency of Iodine in mothers during pregnancy (Stagnaro-Green et al., 2011) (Verma and Raghuvanshi, 2001)

About 120 nations worldwide have salt iodization program in place in 2006, and 34 of those used universal salt iodization to prevent iodine deficiency disorders (UNICEF, 2008). World Health Organization/UNICEF/ICCIDD addressed, the iodine limit in salt is 20-40 parts per million (ppm) (WHO, 2007). The limit is for 90% of households in order to properly use iodized salt (≥15 ppm iodine) & iodine test were used as a sign to monitor the progress of universal salt iodization worldwide (WHO, 1988). Totally 70% has been increased in the usage of Iodized salt by 2000 as compare with 1990(Maberly et al., 2003).

The Iodine deficiency is perhaps the most widely recognized reasons for preventable mental hindrance around the world. In developing nations, about 38million infant baby suffering effects of neurological disorder related with IDDs every year (Hess et al., 2003). Due to iodine deficiency the score of Intellectual Quotient Mean (IQ) mean are diminished to 13.5 (Bhat, 2009).

Government of Pakistan has been initiated Universal Salt Iodization (USI) program by 1994 to address the challenge of IDD and like other countries the GoP also initiated the program in a similar manner in Asia where the governments realized the value and importance of consuming iodized salt to address IDD challenges and took consequent action to ensure salt was appropriately iodized (Codlinget al., 2017; Laillouet al., 2015).

Pakistan is a country with history of iodine deficiencies (Sikdaret al., 2016). In 1994, Pakistan formally adopted the universal salt iodization program and the result of these efforts showed that there is up to 50% decline in iodine deficiency(Zimmermann, 2013). However, the estimated improvement in IDD eradication is not uniform and may be over-estimated and the main reason for this is lack of proper planning, monitoring, political will and as well as myths related to iodized salt and socioeconomic status(Khattaket al., 2017).

Fetal Damage is quite possibly the most genuine adverse impact of Iodine deficiency because impaired brain is due to insufficient supply of iodine to the fetus(De Escobaret al., 2004). During pregnancy severe iodine deficiency may also result in abortions, congenital abnormalities and stillbirths(Dillon and Milliez, 2000; Pharoahet al., 1971).

For the prevention and control of iodine deficiency disorders in populations, it is recommended that the salt used in food at homes and during processing of foods be fortified with iodine (Aburtoet al., 2014; WHO, 2014). This approach has been used in more than 120 nations throughout the world, and several of them have effectively eliminated iodine deficiency disorders or achieved significant improvements in their management (Al-Dakheelet al., 2018; WHO, 2014).

The majority of these side symptoms are linked to thyroid dysfunction, particularly, hypothyroidism, hyperthyroidism, goiter and autoimmune thyroid illnesses. Furthermore, research on the impact of iodine on organ, and tissues other then the thyroid has been limited. Blood glucose, blood pressure, and lipid metabolism can all be affected by the increased or decreased concentration of iodine in the body (Cornier M et al., 2008). Iodine regulates TH level and the redox system, which impact lipid metabolism, blood glucose and blood pressure fluctuation. Numerous chronic diseases such as cardiovascular diseases can be caused by abnormalities in lipid metabolism, blood pressure and glucose metabolism problems.

The purpose of the study is to observe household iodized salt intake knowledge, attitudes, and behaviors, as well as the factors that affect them. It will assist with increasing the consumption of iodized salt in group of individuals & assume a part in decreasing their occurrence of cretinism and goiter. Hence, the particular point of the study is to decide iodine focus in salt at household levels, knowledge, attitude, and practice (KAP)

identified with IDDS as well as iodized salt and impacts of Knowledge, attitude and practice on the consumption of iodized salt.

1.1 Objectives

The study objectives were to find the association of iodized salt intake and blood pressure of the women in district Attock (Kamra city). The specific objectives were:

To determine the systolic and diastolic pressure of the adult women.

To know the knowledge, attitude and practice of the adult women regarding consumption of iodized salt.

To associate the iodized salt consumption and blood pressure.

II. REVIEW OF LITERATURE

Carmel Punitha Set al., (2022) carried out investigation on knowledge, practice and consumption pattern of dietary salt among adolescent female in Chennai, Tamil Nadu. For the normal growth and development human body require iodine. Iodine deficiency disorder is long term consequences of insufficient iodine intake in under developing nations like India. The Universal Salt Iodization program was launched by World Health Organization to prevent iodine deficiency disorder. In this cross-sectional study we surveyed 200 respondents, 100 from high school and 100 from college. Using a random sampling technique, the data was collected through interview. To analyze the responses of both groups, a chi-square test was used. The findings revealed that less than one-fourth of the respondents which is 21.5% and those with 18% were found to be aware of RDA for salt. 66% of the respondents were aware of the health problems related to high consumption of salt. Iodized table salt was consumed by 52% of all participant, and 68% of them consume salt primarily for its ability to enhance flavor. The majority of respondents 67% preferred to keep the salt in plastic containers and 69% indicated that they added salt between cooking. This study declared that the knowledge of the participants about RDA and IDD was inadequate. The reason of salt consumption, how salt was stored and when salt was added to food revealed their unhealthy habits. This study concluded that educational program should be organized in schools and colleges to give proper knowledge about the consumption of salt and management of salt.

Farzanehnoroozi et al., (2022) conducted a study to access the salt consumption and blood pressure in rural hypertensive patients. This clinical multicenter trial, which included a clinical setting and the community, involved intervention and control group and it was carried out on the residents of 14 villages served by 14 health houses. A multistage random sampling techniques was used to choose 200 hypertensive patients (n= 100 in each group). The intervention included a two-day program on lowering blood pressure and salt intake for medical professionals based on the HBM structure, as well as an eight-session workshop for parents who were in control of the diets for their families. Respondents completed the questionnaire before and after the intervention. In the intervention group families consumed significantly less salt than those in the control group (urine sodium and creatinine decreased by 35mEq/l and 7.5 mg/dL, respectively) compared to control group. The result shows that the intervention group's considerably reduction in blood pressures. The findings indicated that the family's nutrition might be significantly improved by the mother's model-based teaching, which would also result in a decrease in the linked disease. The key benefit of this study was the participation of rural health professionals, who assisted in implementing longer-lasting and more extensive health promotion initiatives in the local communities

HabtamuFekaduGemede et al., (2021) carried out cross-sectional study in jibat woreda, Ethiopia in order to ascertain the availability, knowledge, and practice of the factors associated with iodized salt. The primary objective of this research is to assess iodized salt usage, awareness, and availability at the household level in Ethiopia's Jibat woreda. A pretested questionnaire interviewer was used to perform cross section study within the community. The test on the salt sample was conducted using the iodometric titration method. According to the study's finding that out of 357 191 families, or 53.5%, had good awareness of iodized salt, while 166 (46.5%) had little knowledge. Further research revealed that 195 (54.6%) had poor use of iodized salt whereas 162 (45.4%) had good iodized salt usage. The results of this study also showed that 148 (41.7%) families used enough iodine, compared to 208 (58.3%) households which used insufficient amounts. Knowledge about

iodized salt at the household level was significantly linked with household income, household job, and residence location. Education level, place of residence, monthly average income, and exposure to sunlight were all substantially connected with the accessibility of salt that was sufficiently iodized. This study found that iodized salt was not widely available in the jibat woreda of Ethiopia and that household knowledge and usage were lacking. This is dependent on your level of education, where you live, and your monthly salary. As a result any accountable institution or organization should be expected to work in the aforementioned areas of iodized salt knowledge, practice, and accessibility.

Amani Abdelrahman et al., 2020 conducted a cross-sectional study to assess knowledge, attitude and practice regarding iodized salt in different areas of Al-Riyadh and Al-Ozozab, Khartoum city, Sudan. There were 87 (57%) females among 152 respondents were chosen from Al-Riyadh and Al-Ozozab. Al-Riyadh respondents had a higher educational and economic level than Al-Ozozab respondents, as well as a better understanding of the significance of regular iodized salt intake to cure deficiency of iodine (54% and 61%) respectively. Only 39 percent of the respondents were purchasing iodized salt. Respondents from Al-Riyadh (49%) and Al-Ozozab (30%) localities had a strong link between residency and iodized salt purchase (P-value= 0.02). There was an important relationship between educational level and the purchase of iodized salt p-value= 0.014 but not with wealth p-value=0.23. Sudan has to develop a mandatory national salt specification and observe the supply of iodized salt on the market.

Nigeria, Adeola O AJIBARE et al., (2020) carried out a study to examine the characteristics and blood pressure of goiter patients in south-west Nigeria. In region of the world with insufficient iodine, goiter is still endemic. It recognized as the second most common condition in Nigerian endocrinology clinics. The objective of this study is to access the biochemical, clinical characteristics, and blood pressure profile of patients with goiter and also access the knowledge and practice of preventative technique against goiter. This comparative analysis comprises 103 healthy adults and 103 adults with goiter. Face to face interview was conducted and venous blood sample were taken for examination. A variable includes socio demographic, thyroid function, anthropometric and blood pressure. The average age of the goiter group was 46.92 years and 13.85 months, and 86.4% of them had the swelling for up to five years. Anthropometric measurement, social behavior, practice and knowledge of iodized salt as a prophylactic strategy were equivalent between both goiter and control groups. 46 % of the goitrous participants have been hyperthyroid. Participants in the hyperthyroid category had considerably greater pulse rate and systolic pressure was also high, while the hypothyroid subgroup used to have significantly higher BMI and weight ($p<0.001$). The hypothyroid subgroup had lower pulse pressure and considerably greater diastolic pressure ($p<0.001$). This study found that high systolic and diastolic pressure was more common in people with hyperthyroidism and hypothyroidism. Therefore, it`s necessary for goitrous individual to regularly examine their cardiovascular health.

Satyanarayana Konda et al., (2020) examined a study in order to evaluate people's knowledge, attitudes, and practices about iodine deficiency condition. Iodine deficiency disorder must be understood thoroughly in order to be prevented and controlled in the society. The aim of this study is to determine how much people have knowledge, attitude and practice think, about iodine deficiency disorder (IDD) and using iodized salt in connection with IDD. In Telangana and India's Khammam district, a cross-sectional study was conducted. A total of 272 households were surveyed. A knowledge, attitude and practice questionnaire were used to survey the household head in order to gather data. Information about iodine deficiency disorder knowledge, attitudes, and practices was gathered. It covers symptoms, systems, prevention, therapy, iodine advantages, understanding of iodized salt, and information sources. The descriptive analysis and chi-square test were applied to show the data. The study's findings showed that just 26.1% of households were aware of iodine deficiency condition and 67.6% had heard of iodized salt, with televisions being the most common source of information (51.5%). The majority of households (96.3%) used iodized salt. The iodine content in only 10 samples of salt, or 3.7%, is less than 15 ppm. There was no relationship between socioeconomic status and the kind of salt used in the households, however there was a strong relationship between knowledge of iodine deficiency disorder and education ($p<0.001$) and awareness about the benefits of iodized salt and type of salt used ($p<0.001$). This study concluded that more than 96% of households use iodized salt and more than 50% of households lacked knowledge about iodine deficiency disorders. There is a huge gap between the actual

consumption and the knowledge about the benefits of iodized salt. It is important to conduct educational session on iodine deficiency disorder and about the advantages of iodized salt with an emphasis on the illiterate. Abraham Aregaydesta, (2019) conducted a cross-sectional study to determine Iodine level concentration, coverage of adequately iodized salt consumption and factors affecting appropriate iodized salt utilization among households in North Ethiopia. A sample of 318 household food caterers was interviewed and sample of salts were selected. Golden standard iodometric titration technique was used to determine the concentration of iodine in salt sample. It was found that 26 (8.9%) of the households had properly used iodized salt. Among the households only 51 (17.5%) had adequately iodized salt coverage. %). About 42 (14.38%) had 15 ppm – 80 ppm, 9 (3.08%) had > 80 ppm, 188 (64.4%) had 1.1 ppm to 14.9 ppm and 53 (18.2%) had no iodine in the salt. It was concluded that family size, residence area, affordability and availability of iodized salt were the predictors of proper utilization of iodized salt. In order to stop the production and distribution of under and over iodized salt in the market, regulatory actions and effective use of inspection should be taken.

Agize Asfaw et al., (2019) conducted a cross-sectional study to examine the effect of nutrition education on iodine deficiency disorders and iodized salt consumption in south west Ethiopian women. The worldwide iodine nutrition status is improving, but due to a number of causes the improvement is not consistent. The primary risk factor for inadequate iodine in Ethiopia is inadequate knowledge, negative attitude and poor practice. The objective of this study is to access the impact of a nutrition education on participant's knowledge, attitude and practice on iodine deficiency and the use of iodized salt. A cluster randomized controlled trial with 652 women in the reproductive age group was conducted. A total of 24 clusters were chosen, and they were subsequently randomly assigned to intervention or control village. Intervention village women got 6 months of iodine nutrition related education, while in the control village did not. Data from the beginning and end of the study were gathered from the both groups. The impact of the intervention was evaluated using generalized estimating equations (GEE). In comparison to the control group, women in the intervention group demonstrated statistically considerable changes in their knowledge, attitude and practice score. In the multivariable GEE linear model, the mean difference (95% CI) scores were 8.81 (8.46, 9.16) for knowledge, for attitude is 3.35 (3.17, 3.54), and 2.90 (2.74, 3.05) for practice in the intervention group. This study concluded that efficient technique to increase the KAP of IDD and iodized salt consumption is community-based, well-designed iodine nutrition education.

Andhra et al. (2019) undertook a cross-sectional study, in order to assess iodized salt use in rural populations and related factors in the Prakasam district. Households of four villages were selected and interviewed. Several aspects of the use of iodized salt in the communities, including cooking behaviors, the type of salt used in homes, practice of salt storage, and knowledge of iodine deficient disorders, were evaluated. MBI kits of Iodine Rapid test were use for to examine the testing in the salt. In order to analyze the data, SPSS 22.0 was used. According to the findings, 83.6% of the families used iodized packed salt, 75% had salt that was sufficiently iodized with 15 ppm, and 25% had salt that was insufficiently iodized. It was concluded that there were educational programs to increase the awareness in the community related to handling and importance of utilization of iodized salt.

Jahiduret al. (2019) demonstrated a study to determine factors associated with the accessibility of iodized salt at household level. By using Bayesian mixed-effects logistic models' relationship between different factors including socio-economic status and accessibility of iodized salt at household level were explored. The 50981 households were selected. Results indicated that to some extent 73.15 percent of household salt sample were iodized. In urban households 2.88 times has more iodized salt while in rural area iodized salt was less. The district locations of the households were a significant element that contributed to the local iodized salt coverage. It was concluded that there should be iodized salt intervention which could help out the policy makers to propose intervention in the regions of Bangladesh.

Jiwei Liu et al. (2019) carried out a cross-sectional study to explore the effect of high iodine intake on blood glucose, blood pressure, and blood lipids in adults. Three villages from the province of Shanxi are chosen. Based on the amount of iodine in adults' urine, the three villages were categorized as having sufficient, adequate or excessive iodine levels. Blood tests for thyroid function, blood sugar, blood lipids, and blood pressure were all performed. Adults in the iodine sufficient and iodine excess locations had reduced high

density lipoprotein cholesterol and higher systolic and diastolic blood pressure, blood glucose, and haemoglobinA1C ($p<0.001$). Free thyroxin, urinary iodine, and thyroid stimulating hormone all have nonlinear relationships with blood sugar. The findings showed that excessive iodine consumption can increase blood pressure, blood glucose levels, blood lipid levels, and the risk of diabetes and hypertension.

Nabarunet al. (2019) described a study to evaluate the association between socio demographic factors and knowledge, attitude, and practices (KAP) related to the intake of iodized salt among the women in rural area of Tripura. A sample size of 270 rural women was selected. Data was collected by the interview related to the Information on KAP about iodized salt intake. Outcomes showed that women age of ≤ 36 years had significant and strong relationship with the knowledge and attitude related to the consumption of iodized salt (P <0.05). Well and good knowledge and attitude about the utilization of iodized packed salt was 46.7% and 41.1% respectively which was less. It was concluded that there should be motivation and nutrition education program about the awareness regarding benefits of consumption of iodized salt.

WalleligneBeyene Tariku et al. (2019) investigated in a cross-sectional study to evaluate the knowledge and utilization of iodized salt and factors associated with, at household level districts of Mecha. Data was collected by a standard questionnaire. The iodized rapid test was used at house hold level and SSPS software was used to analyze the data. It was found that in 700 selected household, 639 91.3% were females. The occurrence of knowledge was 201(28.7%).443 (63.3%) was the accessibility of sufficient iodized salt. The education status, occupational status and residency area were predictor on iodized salt were important to usage. The finding suggested that there should be knowledge about the consumption, utilization and the accessibility of enough iodized salt.

III.MATERIALS AND METHODS

3.1 Location of the Study:

The study was conducted in Kamra, District Attock.

3.2 Sample size and Inclusion criteria:

A sample size of 300 households was randomly selected and was divided into iodized and non-iodized salt consuming group.

Inclusion criteria of the study was the age i.e. age > 20 years and involve in cooking. A consent form was signed from the respondents after explaining the purpose of the study. Subjects who were decline consent were excluded from the study.

3.3 Study Design and Protocol:

The study was community based cross sectional study. A questionnaire (Appendix-I) was used for the interview. Regarding utilization of iodized salt in cooking, there were 10 knowledge questions, 5 attitude questions, and 5 practice questions. The KAP questions were scored accurately.

After face-to-face interview session, about 15 g (3 teaspoon) sample of table salt which was used for iodine analysis. Rapid test kit was used to determine the content of iodine in household salt. A drop of the kit was put on salt for color development which was then compared with the standard colors of the kits for iodine concentration such as dark purple (30ppm) purple color (20ppm) and light purple (10ppm) and no color development(0ppm). Digital BP apparatus was used to measure systolic and diastolic pressure of the women. The content of iodine in the salt was classified into inadequate (≥10ppm), adequate (30ppm) and no iodized salt (0ppm).

3.4 Data Collection

Demographic status

Demographic data was collected by interviewing the women about their age, name, area name and educational level were recorded in questionnaire (Appendix-I).

Anthropometric Measurement

Anthropometric measurements including weight, height, and waist circumference, hip circumference, mid upper arm circumference (MUAC), BMI and WHR were taken using appropriate procedure.

Weight

1. The weight was measured by using the following equipment's that include questionnaire, pencil, clip board and digital scale.
2. The scale was first set at zero to avoid any error.
3. Respondents were requested to remove their shoes, items in their pocket and heavy clothes such as coats and sweaters, before being weighed.
4. Respondent was asked to stand on weight machine without moving.
5. The weight measurement was recorded on questionnaire.
6. Respondent was asked to step off the scale after measuring weight.

Height

Height of the respondent was measured with ordinary measuring tape and was noted in questionnaire.

1. The height was measured by using the following equipment's that include questionnaire, pencil, clip board and digital scale.
2. The respondents were asked to remove shoes; headbands, and other heavy clothing before measuring height.
3. Respondents were asked to stand with their feet together, flat, and facing the wall.
4. Respondents were asked to look straight, level their shoulders, arms at sides, and straight legs.
5. The measurements were recorded while the respondent was standing straight so that their head, shoulders and heels touching the surface.
6. The spot where the headpiece meets the wall was marked and the height of the respondent was measured using metal tape to measure the floor base to the mark on the wall,

BMI

Body mass index (BMI) was calculated as ratio of weight by square height (m^2). BMI has different range in which

Underweight less than 18.5,
Normal range is 18.5 to 24.9,
Overweight range is 25.0 to 29.9 and
Obese range is 30.0 or greater than 30.0 (World Health Organization, 2003)

MUAC

Mid upper arm circumference was measured by MUAC tap according to WHO standard method. Briefly,

1. The subject was asked to stand straight and asked to remove any cloth on her arm.
2. The respondent was asked to bend their arm at a 90-degree angle to the body and then notice the midpoint between the tip of shoulder and elbow of the upper arm and mark with a pen.
3. Respondent was asked to relax the arm that is hanging straight down. Place the MUAC tape window (0cm) on the midpoint and wrap a MUAC tape around the arm at the midpoint mark. While maintaining the right hand firmly on the arm, feed the MUAC tape through the hole in the tap.
4. The tape was around the arm until it fits firmly, keeping the right hand stable on the respondent's arm.
5. Measurement was recorded by using the MUAC tape window that is closest to the centimeter (cm).

Waist Circumference

1. The waist circumference was measured by using the following equipment's that include questionnaire, measuring tape, pen and paper.
2. Non-stretchable measuring tape was used to measure waist circumference to the closest 0.1cm.

3. The respondent was asked to stand straight and wrapped a measuring tape on the belly button, just above the hipbone.
4. Respondent was asked to don't hold the breath while measuring.
5. For women the waist circumference range is from 78-91cm and for the men the waist circumference ranges from 83-98cm (Molarius et al., 1999).

Hip Circumference

1. The hip circumference was measured by using the following equipment's that include questionnaire, measuring tape, pen and paper.
2. A non-flexible tape was used to measure hip circumference.
3. The non flexible tape was wrapped around the widest part of the hips to measure the hip circumference.
4. After measurement the tape was removed and the value was recorded in the questionnaire.
5. For the women the average hip circumference should be 97-108 cm and for the men average hip circumference should be 94-105cm respectively (Molarius et al., 11999).

WHR

The waist to hip ratio was calculated by dividing the waist circumference by the hip circumference. According to WHO, the normal range of WHR for women is less than 0.85, while for men it is less than 0.90 (Molarius et al., 1999). If values are higher than the normal then these were considered dangerous.

Blood Pressure Measurement

Digital BP apparatus was used for measuring the blood pressure of each individual. Blood pressure was observed to be normal if it was less than 120 millimeters of mercury (mmHg) for systolic pressure and less than 80 mmHg for diastolic pressure. However, it was considered elevated if found>120mmHg for systolic and > 80 mmHg consider for diastolic (Beevers et al., 2001).

3.5 Statistics Analysis

Data was entered and analyzed by using statistic 8.1, SPSS 21 and Excel. Chi-square test was used to correlate the Means of the iodized and non-iodized salt group. Mean ± SD was calculated by Descriptive statistics in SPSS. Independent t-test was used for the mean comparison of the two different groups. P value <0.05 was used for the significant level.

IV. RESULT AND DISCUSSION

The cross-sectional study was conducted in Kamracity district (Attock) to determine the knowledge, attitude and practice regarding consumption and utilization of iodized salt. For this study 300 households were selected. In addition, their weight, height, age, body mass index (BMI), mid upper arm circumference (MUAC) was also calculated. The amount iodine in salt was also recorded.

Table 1: Frequency distribution of demographic characteristics (n =300)

Age (years)	**Frequency (%)**
20-30	101 (33.7)
31-40	164 (54.7)
Above 40	35 (11.7)
Educational status	
Illiterate	19 (6.3)
Elementary	69 (23.0)
High school	88 (29.3)
Intermediate and above	124 (41.3)
Salt status	
Iodized	180 (60)

Non-iodized	120 (40)

Table 1 shows the frequency distribution of the respondents. This study aim was to know the knowledge, attitude and practices of the locals of kamra toward the use of the iodized salt. According the table 1, most the interviewed respondents were more than 30 years of age. According to (Barbel et al. 2016) ages have effect on the interviews such as the older and younger respondents were affecting differently the answering of the proposed question. Regarding education the respondents were divided into four group's i.e. illiterate, elementary, High school, intermediate and above according to the level of education. According to table 1 most of the respondent's lies in intermediate group and minimum respondents lie in illiterate group. So majority of the respondents were highly educated. The results of the current study are in contrast with (Habib et al. 2021) who reported that only 6.4% of the respondents who had educational level were intermediate or above.

Table 1 also shows that respondents were classified into two groups that are iodized group and non-iodized group. Respondents of each group were interviewed for the consumption of iodized salt. Those respondents whose salt test shows the presence of iodine in their salt sample were allotted iodized salt group and others were allotted to the non-iodized group. These results are in line with the Abraham Aregay Desta et al. (2019) who also reported that iodine was inadequate in the salt of Ethiopia where adequate coverage for the iodized salt was claimed. According to the WondimagegnPaulosKumma et al. (2018) who reported that some factors affect the presence of sufficiently iodized salt at home and a low percentage of houses with appropriate iodized salt was reported. They concluded the enhancing the supply of appropriate iodized salt.

These results are in line with Djibril M Ba et al. (2020) who concluded that the use of non-iodized salt differs from country to country in Sub-Saharan Africa. The increased usage of non-iodized salt among young women, poor, and pregnant women is especially alarming for their growth and development.

Table 2: General characteristic of respondents

General characteristics		**Mean ± SD**
Weight (kg)		73.46 ± 12.85
Height (cm)		154.82 ± 5.50
BMI	Under weight	17.72±0.63
	Normal	21.97±2.10
	Over weight	27.83±1.42
	Obese	34.89 ±4.09
MUAC (cm)		29.77 ± 4.36
WC (cm)		101.55 ± 14.89
HC (cm)		111.35 ± 13.22
WHR		0.90 ± .050
Systolic (mmHg)		131.0 ±23.98
Diastolic (mmHg)		79.80±8.62

BMI = Body Mass Index; WC = Waist Circumference; MUAC= Mid Upper Arm Circumference; HC = Hip Circumference;

WHR = Waist to Hip ratio.

Table 2 shows the general characteristics of all studied participants. BMI shows that majority of the respondents were obese. According to the (Boyanov et al. 2004) who reported the comprehensively studied factor for thyroid gland in iodine level, however gender, age, weight and anthropometric characteristics are also play vital role in the iodine level in the body.

Table 3: Correlation between iodine content in salt and knowledge about iodine

Iodine content in salt (ppm)	Grouping in three categories			
	Poor knowledge	Moderate knowledge	Good knowledge	
Non-iodized	28 (63.6%)	43 (58.1%)	78 (42.9%)	$\varkappa^2$= 14.172 P-value = 0.02
Inadequate	7 (15.9%)	12 (16.2%)	24 (13.2%)	
Adequate	9 (20.5%)	19 (25.7%)	80 (44%)	

Poor knowledge: those who score was 1, Moderate knowledge: those who score was 2 and Good knowledge: those who score was 3.

Table 3 shows the correlation between the iodine content in salt and the knowledge of respondent about the iodine use. Chi square test was used to determine the correlation between iodine salt sample and knowledge. Table 3 shows that value of chi square was 14.17 and ($p < 0.02$) which shows that the correlation is significant and there is a close relationship between iodine content in salt and knowledge about iodized salt which means that those respondents who have good knowledge about iodine so they have adequate content of iodine in their salt. This association shows that respondents have good knowledge about the iodized salt consumption and its requirement so they use iodized salt. The results of current study in line with (Meseret Mamo Bazezew et al. 2018) which indicated that 80 percent of respondents were have good knowledge about the utilization of iodized salt. This study also found that increasing knowledge and practice iodized salt was beneficial. Another study (Abu Tura Bulli et al. 2020) who reported that iodized salt usage in the hetosa district is still quite low, at 38.4 percent and he also indicated that iodized salt use, educational status, good knowledge and practice were all found to be strongly linked with appropriate iodized salt usage. Another study Christiana Buxton et al., (2012) reported that most of the respondents were aware the significance of iodized salt and iodine deficiency disorder, 64.6% of them used iodized salt exclusively.

Table 4: Correlation between educational status of the respondents and knowledge about iodine

Educational status	Grouping in three categories			
	Poor knowledge	Moderate knowledge	Good knowledge	
Illiterate	3 (6.8%)	5 (6.8%)	11(6.0%)	$\varkappa^2$= 21.599 P-value=0.001
Elementary	17 (38.6%)	22 (29.7%)	30 (16.5%)	
High school	16 (36.4%)	23 (31.1%)	49 (26.9%)	
Intermediate and above	8 (18.2%)	24 (32.4%)	92 (50.5%)	

Table 4 shows that knowledge is significantly correlated ($P<0.05$) with educational status such as the increase in the years of education increases the knowledge about consumption and utilization of iodized salt also increases. Majority of the respondents have good knowledge about iodized salt consumption because they were well educated. According to WalleligneBeyene Tariku et al. (2019) who reported knowledge, educational status and packaging have all been found as factors that influence iodized salt use in home. The results of our study are in line with HabtamuFekaduGemede et al. (2021) who carried out research to assess knowledge, practice and accessibility of iodized salt at household level and its associated factor in jibat, Woreda Ethiopia which indicated that at the household level, knowledge about iodized salt was substantially related to household job, residency, educational status and average monthly income. Another study Ahmed Elnadif et al. (2017) also reported the parallel results lacks of knowledge about iodized salt was reported in less educated people. Another study Gidey B et al., (2015) reported that formal education, good knowledge of iodized salt and iodine deficiency disorder, and short-term salt storage at home were all related to the availability of sufficient iodized salt.

Table 5: Correlation between iodine in salt sample and attitude of respondents about iodized salt consumption

Iodine content in salt ppm	Classification of attitude			
	Negative	Indifferent	Positive	
Non-iodized	2 (14.3%)	57 (56.4%)	72 (38.9%)	$\varkappa^2$= 13.242 p-value = 0.03
Inadequate	4 (28.6%)	16 (15.8%)	23 (12.4%)	
Adequate	8 (57.2%)	28 (27.7%)	90 (48.6%)	

Table 5 shows that iodine in salt sample is significantly (P<0.05) correlated with attitude of respondents which means that there is close relationship between attitude and iodine in salt sample. In this study 48.6% respondent who had positive attitude score on using iodized salt (30 ppm). According to HadguGerensea et al. (2015) reported a parallel study that those respondents who consume iodized salt at household level their attitude was good. Another study TafereGebreegziabher et al., (2014) reported that women of Ethiopia had good knowledge and positive attitude about iodized salt. This study results are in contrast with Habib et al. (2021) who reported that among 400 respondents, only 16.2 percent had a positive attitude score and about 42.8 percent had negative attitude. The possible reason of this contrast might be the education level of the respondents because most of the respondents of the aforementioned study were uneducated. This study differs from Ahmed Elnadif et al. (2017) who reported that most of household has lacks of knowledge and also has negative attitude about iodized salt consumption.

Table 6: Correlation between educational status and attitude of respondents about iodized salt consumption

Educational status	Classification of attitude			
	Negative	Indifferent	Positive	
Illiterate	1 (7.1%)	8 (7.9%)	10 (5.4%)	$\varkappa^2$= 5.302 p-value=0.005
Elementary	4 (28.6%)	24 (23.8%)	41 (22.2%)	
High school	5 (35.7%)	22 (21.8%)	61(33.0%)	
Intermediate and above	4 (28.6%)	47 (46.5%)	73(39.5%)	

Table 6 shows a significant correlation (p<0.005) of the attitude and education level of the respondents. Most of the respondents were highly educated and they show positive attitude toward the iodized salt utilization. These finding are supported by Habib et al. (2021) who reported that the educational status of the respondents were significantly correlated (p<0.05) with knowledge and attitude of iodized salt consumption. Another study Amani Abdelrahman et al. (2020) results are also in line with the current study who reported that there was also a significant relation (p<0.05) between educational status and purchasing iodized salt (p=0.014) in two different areas of Al-Riyadh and Al-Ozozab, Khartoum city, of Sudan. Parvin mirmiran et al. (2013) who reported that educational status of the tehranian women was significantly (p<0.05) associated with knowledge and attitude but not with practice. AgizeAsfwa et al. (2020) who reported that iodine nutrition education is well design technique for improving the knowledge, attitude and practice of iodine deficiency disorder and iodized salt consumption in south west Ethiopian women. Satyanarayana Konda et al. (2017) who reported that there was significant association between knowledge of IDD and education p<0.001 and more than 96% of household consume iodized salt.

Table 7: Correlation between iodine content in salt and practice scores of respondents about iodized salt consumption

Iodine content in salt ppm	Categories of practice			
	Poor	Moderate	Good	
Non-iodized	51 (94.4%)	95 (95.0%)	3 (2.1%)	$\varkappa^2$=25.991 P-value=0.03
Inadequate	3 (5.6%)	3 (3.0%)	37 (25.3%)	
Adequate	0 (0%)	2 (2%)	106 (72.6%)	

Table 7 indicated that respondent practice was significantly ($p<0.05$) correlated with the content of iodine in salt. The percentage of iodized salt consuming respondents was higher among those participants who had a good practice score. The results of this study are in contrast with Habib et al. (2021) which show that the use of iodized salt was substantially less common among those participants who had good practice score. The possible reason of this contrast might be the test kit manufacturing differences. In previous research DATTA et al. (2018) who reported that majority of the respondent had good knowledge and practice about the usage of iodized salt at home, but most of them still failed to add salt while cooking. The study results are in line with NabarunKarmakar et al. (2019) who reported that good knowledge and good attitude about the usage of iodized salt were found to be less than half (46.7 %) but good practice was found in a large proportion (83.3%). H. Gerensea et al. (2016) reported that the practice of utilizing it in various households has a significant impact on the proper usage of iodized saltinHaweltikebelle, Axum and Ethiopia.

Table 8: Correlation between educational status and practice score of respondents about iodized salt consumption

Educational status	Categories of practice			
	Poor	Moderate	Good	
Illiterate	4 (7.4%)	9 (9.0%)	6 (4.1%)	$\varkappa^2$= 15.622 P-value= 0.01
Elementary	15 (27.8%)	28 (28.0%)	26 (17.8%)	
High school	22 (40.7%)	25 (25.0%)	41 (28.1%)	
Intermediate and above	13 (24.1%)	38 (38.0%)	73 (50.0%)	

Table 8 shows strong correlation between educational status and practice of iodized salt. The percentage of using iodized salt was higher among those respondents who were highly educated mean that those respondents who had knowledge about iodized salt had good practice score. Our results are in line with the study of Meseret Mamo Bazezew et al. (2018) who reported that respondent educational status was substantially correlated with practice of iodized salt, whereas, the results are in contrast with T. Gebreegziabheret al. (2021) who reported that educational status of the participants are significantly associated with knowledge and attitude but non-significantly ($p>0.05$) associated with practice. This non- significantly association of education with the practice might be because of the common practice of iodized salt consumption because people are well informed about iodized salt. Salt producers, government legislation and monitoring ensure 100% iodized salt availability. This study results are in contrast with the Safaa Khamis Hassan et al. (2020) who reported that majority of studied respondents (87.1%) use iodized salt but their knowledge about iodized salt and iodine was inadequate and most of the respondents had incorrect iodized salt consumption practices.

Figure 1: Comparison of systolic pressure based on iodized and non-iodized salt consumption

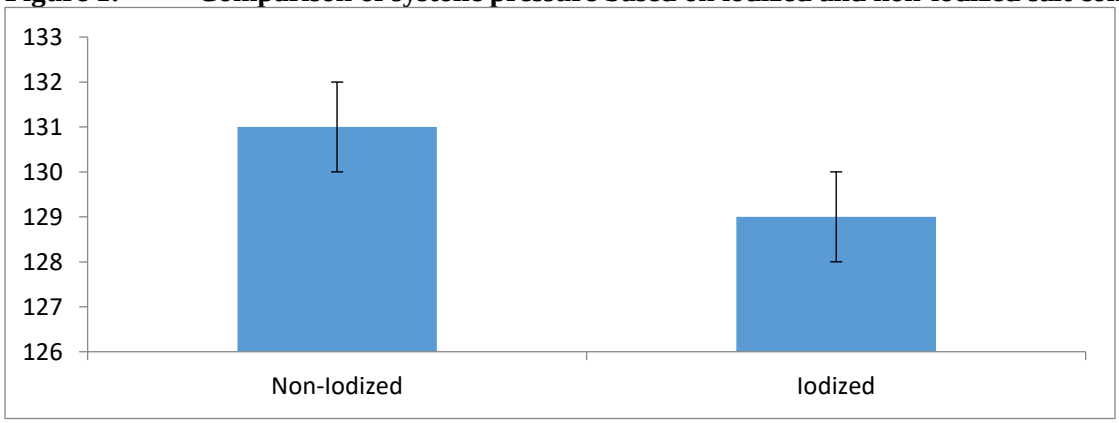

Figure1 shows the significant ($p<0.05$) association of systolic pressure with the type of salt i.e. iodize and non-iodize. The lower mean of systolic pressure of iodized salt consumer from the non-iodized salt consumer might be because of the education level i.e the respondents of iodize salt user were well educated. These results are

in line with YunusErdem et al. (2010) who reported that salt intake and blood pressure were found to be positively correlated in Turkish people and they also indicated that there was a positive association between salt consumption and systolic pressure. Another study Mia-Maria Perala et al. (2011) who reported that there was a positive relationship between salt intake and systolic blood pressure in adults born with low birth weight. This study differs from Paul N. Jensen et al. (2018) who reported that at the national level in Viet Nam, there was no evidence of a correlation between salt intake and high systolic pressure. According to Francesco P Cappuccio et al. (2006) who reported that lower the salt intake lower the blood pressure in western Africa.

Figure2: Comparison of systolic pressure based on iodized and non-iodized salt consumption

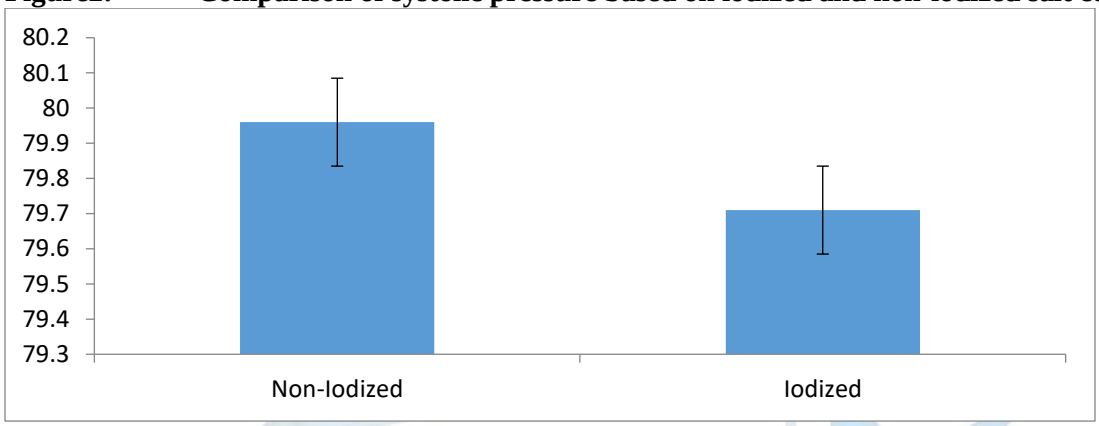

Figure2 shows significant ($p<0.05$) association between diastolic pressure and type of salt consumption. Respondents whose were using iodized salt presented normal diastolic pressure which might be because of their education level. Another study FarzanehNoroozet al., (2022) who reported that the women awareness campaign had a significant impact on lowering blood pressure and salt intake of the rural hypertensive patient. This study results are differ from Alireza Khosravi et al., (2012) who reported that in the Iranian people the lifestyle community intervention was helpful in lowering the rising trend of salt consumption and blood pressure. Nemam Ali Azadi et al.,(2021) also reported a parallel result that education was found effective in prevention of hypertension. Another study MoretezaBabaei sis et al., (2016) reported that education intervention was effective in promoting nutrition, weight management, physical activity and mental health of patient with hypertension and also reported their controlled blood pressure and healthy life style. The current study results are in line with Izadirad et al., (2013) reported that in comparison to other conventional training, educational program based on the BASNEF model produced greater outcomes in the control of blood pressure. This study results differ from Carmel Punitha et al. (2022) who reported that adolescent female has inadequate knowledge and practice about the consumption of iodized salt and also iodine deficiency disorder. Another research Hemant Mahajan et al. (2012) reported that the main cause of high blood pressure and BMI is poor practice of iodize salt consumption. Inadequate knowledge regarding hypertension resulted in poor practice.

VI. CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS:

- Consumption of iodized salt was significantly correlated with knowledge about iodine.
- Knowledge about iodized salt consumption was significantly associated with educational status of the respondents.
- Consumption of iodized salt was significantly associated with the positive attitude of the respondents.
- Educational status of the respondents was significantly associated with positive attitude of respondents
- Educational status of respondents was significantly correlated with practice of iodized salt.
- Systolic and diastolic pressure was significantly correlated with iodized salt consumption

RECOMMENDATION

The following recommendations were drawn:

- Mass media awareness regarding iodize salt consumption.
- Monitoring of the field for the ensuring proper iodization of salt.

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