



## **Functional Limitations of Hyper and Hypothyroid Patients in INMOL Hospital Lahore, Pakistan**

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### **Authors' contributions**

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

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### **ABSTRACT**

**Introduction:** Thyroid disease is extremely prevalent than heart diseases or diabetes. Hormones produced by the thyroid gland maintain the muscles, heart, brain, and other organs of the body. Improper performance of the thyroid gland leads to an overactive thyroid (hyperthyroidism) or underactive thyroid (hypothyroidism) that disturbs the metabolic system. The objective of the present study is to investigate the functional limitations of the patients under these two types of thyroid disorders.

**Methods:** A cross-sectional study design is used to collect the data from thyroid disease patients in INMOL hospital Lahore, Pakistan from 23<sup>rd</sup> November 2020 to 20<sup>th</sup> January 2021. A total of 201 patients (98 hyperthyroid, 103 hypothyroid) are enrolled in this study. Data is analyzed through frequencies, percentages, and chi-square test of association by using SPSS (version 23).

**Results:** Females over 30 years of ages, married, overweight with family sizes are less than four with a positive family history of brothers and sisters using iodized salt are more at risk of hypothyroidism and faced the problems like speedup in the metabolic system, weight gain, slow heartbeat, low blood pressure, weakness in muscles, constipation, coldness when others do not. Eventually it causes difficulties in routine activities, irregularities in the menstrual cycle and

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problems in pregnancy.

**Conclusion:** By considering all these evidences, early diagnosis and precautionary steps are needed to avoid the prevalence of thyroid disease specifically in women.

*Keywords: Thyroid gland; hyperthyroidism; hypothyroidism; chi-square test.*

## 1. INTRODUCTION

Over 200 million people across the globe and more than 50 million Americans have a thyroid disorder [1]. Approximately 20% of thyroid victims end in death while 80% are diagnosed with hypothyroidism [2]. Females are more at stake of the disease than males and 50% of the children with parents having the thyroid disorder develop the disease [3]. In Pakistan, 5-10 percent of the population has thyroid disorder [4]. Unfortunately, thyroid side effects are normally exceptionally nonspecific and ought to be kept in the differential determination of numerous clinical protestations [5]. Complexities that can emerge from untreated thyroid illness include high cholesterol levels, coronary illness, infertility, muscle shortcoming, and osteoporosis [6]. TSH test is the most common method used for thyroid disorder diagnosis and determines the amount of TSH in blood [7]. Generally, in hypothyroidism or underactive thyroid, the thyroid gland does not produce enough thyroid hormone that a body needs, and consequently the reading of TSH is below the normal range. Normally, in hyperthyroidism or overactive thyroid, the thyroid gland produces too much thyroid hormone that a body needs and consequently the reading of TSH is above the normal range [8]. Also, the T4 test and T3 test are used for further confirmation of the diagnosis or to determine the cause of the thyroid disorder [9].

The thyroid gland is the biggest gland located in the anterior neck and produced thyroid hormone that influences all tissues of the body and regulates the metabolism [10]. Sometimes this gland dysfunctions and produces too low (hypothyroidism) or too high (hyperthyroidism) thyroid hormone which is dangerous for the metabolic system and often causes thyroid cancer [11]. Hashimoto disease is the major reason for hypothyroidism in which the thyroid gland is inflamed and affects the immune system. This often guides the pituitary gland to release more TSH and often enlarges the thyroid gland (goiter) [12]. The low quantity of iodine in the diet is another risk factor of hypothyroidism [13]. Common signs of hypothyroidism consist of

weight gain, fatigue, hair loss, brittle nails, decreased appetite, puffiness around the eyes, change in menstrual periods in women, muscle aches, loss of sex drive, constipation, and feeling cold when others do not [14]. In hyperthyroidism, the metabolic system speeds up due to excess thyroid hormone. Graves disease is the most common cause of hyperthyroidism and often females between the age of 20 years to 40 years victimized [15]. Symptoms of hyperthyroidism include tremors, fatigue, more frequent bowel movements, weight loss, increased sweating, nervousness, rapid heartbeat, changes in menstrual periods, and feeling hot when others do not [16]. In the present research, we study the differences in functional limitations and symptoms under hyperthyroidism and hypothyroidism among thyroid disorder patients from INMOL hospital Lahore, Pakistan.

## 2. METHODS

Cross-sectional data from 201 patients who visited INMOL hospital, Lahore is collected during the period of 23<sup>rd</sup> November 2020 to 20<sup>th</sup> January 2021. A self-administered questionnaire consisting of demographic information and risk factors related to thyroid disease is designed to collect the information. Hospital's management was contacted by the researcher and after getting their permission the study purpose was explained to the visited patients in the hospital. Verbal consent was taken from the outdoor patients to participate in the research before collecting the information. All the patients who showed their interests were included and the patients who refused to participate or drop the questionnaire at some stage were excluded from the study. Frequencies, percentages, and chi-square test of association were used to analyze the data by using SPSS (version 23).

## 3. RESULTS

Results presented in Table 1 showed that out of 201 patients with a thyroid disorder, 103 (52.2%) are suffering hypothyroidism and 98 (48.8%) are from hyperthyroidism. The majority of the respondents are female (67.2%) and most of them (60.3%) were facing hypothyroidism.

Concerning the age of the patients, 78(38.8%) were almost 30 years, 87(43.3%) are 31 to 40 years and 36 (17.9%) are above 40 years of age.

Out of 201 patients, 145 (72.1%) are married, 103 (51.2%) with family income of 25000/- per month. The 6(3.0%) respondents found underweight, 65 (32.3%) have normal weight, 102 (50.7%) were only overweight while 28 (13.9%) were obese. For the variable family size, 74 (36.8%) have almost 3, 103 (51.2%) have 4 to 5 and 24 (11.9%) have at least 6 members in their family. Duration of the disease; 51 (25.4%) were less than or equal to 1 year, 105(52.2) were from 1 to 5 years and 45 (22.4%) were from more than 5 years. Most of the respondents had no history of the disease in their brothers/sisters i.e. 148 (73.6%), parents i.e. 154 (76.6%), and relatives i.e. 147 (73.1%). Majority of the patients had no thyroid cancer such as 81 (90.0%); use iodized salt with frequency 116 (57.7%); use TSH tablets with frequency 193 (96.0%); do not use TSH injections with frequency 129 (65.2%), not stable level of TSH before treatment with frequency 162 (81.8%); stable level of TSH after treatment with frequency 104 (51.7%); satisfied with health condition with frequency 112 (55.7%) and regularity in thyroid test less than 6 months with frequency 132 (65.7%).

Table 2 results depict that patients of the thyroid disease had encountered; speedup in metabolic system with frequency 109 (54.2%); slowdown in metabolic system such as 82 (40.8%); weight gain i.e. 103 (51.2%); weight lose i.e. 76 (37.8%); heartbeat fast such as 102 (50.7%); heartbeat slow i.e. 62 (30.8%); increase in BP with frequency 65 (32.3%); decrease in BP with frequency 95 (47.3%); mood swings such as 157 (78.1%); fatigue i.e. 193 (96.0%); depression i.e. 91 (45.3%); weakness in muscle with frequency 178 (88.6%); constipation with frequency 96 (47.8%); irregularities in sleep cycle i.e. 81 (40.5%); difficulties in breathing such as 117 (58.2%); feel coldness when other do not i.e. 118 (58.7%); difficulties in performing routine activities i.e. 63 (31.7%); irregularities in menstrual cycle with frequency 98 (71.0%); problems in pregnancy such as 77 (60.6%); enlargement in thyroid gland such as 90 (44.8%) and surgery for thyroid gland with frequency 45 (22.5%).

#### 4. DISCUSSION

Thyroid carcinomas speak to the most widely recognized type of endocrine organ malevolence

[17]. Both types of thyroid dysfunction hyper and hypothyroidism are associated with gender and the incidence of hypothyroidism is significantly higher in women than men while the men were more at risk of hyperthyroidism than the women [18]. Hypothyroidism is found to be positively associated with age and mostly reported by the elder age group whereas hyperthyroidism is inversely linked with age [19]. Among married patients, hypothyroidism is common whereas hyperthyroidism is mostly reported by singles [20]. BMI was also significantly associated with the type of thyroid dysfunction. Among underweight and normal-weight cases hyperthyroidism is higher whereas hypothyroid patients are significantly higher among the overweight or obesity group [21]. Hyperthyroid problem is more common in the nuclear family whereas hypothyroid is highly reported by patients from the joint family system. Also, the size of the family is associated with the type of the disease. Those who have a family history of thyroid disorder in brother or sister are hypothyroid whereas the family history of parents and relatives is not associated with the type of thyroid dysfunction [22]. Although thyroid cancer reported cases are less in the sample but most of them are hyperthyroid. The use of iodized salt is also associated with the type of thyroid disease and hypothyroid disorder is common in cases that use iodized salt whereas those who did not use iodized salt face hyperthyroidism [23]. The factors discussed above are mostly relevant with the literature which justifies the clinical significance of the study. Hence major recommendations to prevent with the disease can be the use of iodized salt in daily routine and to include exercise as a habit in daily life to get rid of over weight issue.

The metabolic system in hypothyroidism speeds up whereas in hyperthyroidism its slowdowns. Speedup in the metabolic system is also associated with the age and duration of the disease. Type of thyroid disorder also had a significant effect on weight and hypothyroid cases gain the weight whereas it is loosed in hyperthyroid patients. The effect of weight is also associated with gender, BMI and duration of the disease [24]. Female patients gain more weight than the male. Thyroid disorder had an impact on the heartbeat and has been associated with the type of thyroid disease. Patients with hyperthyroidism reported fast heartbeat whereas it is slow among hypothyroid patients [25].

**Table 1. Descriptive and inferential statistics of patients profile and types of thyroid disease**

|  |               | N          | Type of thyroid disease |                | P-Value |
|--|---------------|------------|-------------------------|----------------|---------|
|  |               |            | Hyperthyroidism         | Hypothyroidism |         |
| Gender                                       | Male          | 65 (32.2)  | 44 (67.7)               | 21 (32.3)      | 0.0002  |
|  | Female        | 135 (67.2) | 54 (39.7)               | 82 (60.3)      |         |
| Age (Years)                                  | < 30          | 78(38.8)   | 48 (61.5)               | 30 (38.5)      | 0.013   |
|  | 31-40         | 87(43.3)   | 37 (42.5)               | 50 (57.5)      |         |
|  | > 40          | 36(17.9)   | 13 (36.1)               | 23 (63.9)      |         |
| Marital Status                               | Married       | 145( 72.1) | 64 (44.1)               | 81 (55.9)      | 0.035   |
|  | Single        | 56(27.7)   | 34 (60.7)               | 22 (39.3)      |         |
| BMI  | Underweight   | 6 (3.0)    | 4 (66.7)                | 2 (33.3)       | 0.009   |
|  | Normal Weight | 65 (32.3)  | 38 (58.5)               | 27 (41.5)      |         |
|  | Overweight    | 102 (50.7) | 50 (49.0)               | 52 (51.0)      |         |
|  | Obesity       | 28 (13.9)  | 6 (21.4)                | 22 (78.6)      |         |
| Family Status <sup>a,b,c</sup>               | Nuclear       | 137 (68.2) | 75 (54.7)               | 62 (45.3)      | 0.013   |
|  | Joint         | 64 (31.8)  | 23 (35.9)               | 41 (64.1)      |         |
| Family Size                                  | ≤ 3           | 74 (36.8)  | 29 (39.2)               | 45 (60.8)      | 0.048   |
|  | 4-5           | 103 (51.2) | 53 (51.5)               | 50 (48.5)      |         |
|  | ≥ 6           | 24 (11.9)  | 16 (66.7)               | 8 (33.3)       |         |
| Family Income (Rs.)                          | ≤ 25000       | 103 (51.2) | 55 (53.4)               | 48 (46.6)      | 0.177   |
|  | > 25000       | 98 (48.8)  | 43(43.9)                | 55 (56.1)      |         |
| Duration of Disease (Years) <sup>a,b</sup>   | ≤ 1           | 51 (25.4)  | 26 (51.0)               | 25 (49.0)      | 0.147   |
|  | 1 – 5         | 105 (52.2) | 45 (42.9)               | 60 (57.1)      |         |
|  | > 5           | 45 (22.4)  | 27 (60.0)               | 18 (40.0)      |         |
| Family History (Brother/Sister) <sup>a</sup> | Yes           | 53 (26.4)  | 18 (34.0)               | 35 (66.0)      | 0.012   |
|  | No            | 148 (73.6) | 80 (54.1)               | 68 (45.9)      |         |
| Family History (Parents) <sup>d</sup>        | Yes           | 47 (23.4)  | 20 (42.6)               | 27 (57.4)      | 0.331   |
|  | No            | 154 (76.6) | 78 (50.6)               | 76 (49.4)      |         |
| Family History (Relatives) <sup>b,d</sup>    | Yes           | 54 (26.9)  | 25 (46.3)               | 29 (53.7)      | 0.672   |
|  | No            | 147 (73.1) | 73 (49.7)               | 74 (50.3)      |         |
| Thyroid Cancer                               | Yes           | 20 (10.0)  | 17 (85.0)               | 3 (15.0)       | 0.013   |
|  | No            | 81 (90.0)  | 88 (46.6)               | 101 (53.4)     |         |
| Use Iodized Salt                             | Yes           | 116 (57.7) | 37 (31.9)               | 79 (68.1)      | 0.000   |
|  | No            | 82 (45.3)  | 61 (71.8)               | 24 (28.2)      |         |

|                                   |              | N          | Type of thyroid disease |                | P-Value |
|-----------------------------------|--------------|------------|-------------------------|----------------|---------|
|                                   |              |            | Hyperthyroidism         | Hypothyroidism |         |
| Regularity in Thyroid Test        | < 6 months   | 132 (65.7) | 62 (47.0)               | 70 (53.0)      | 0.141   |
|                                   | 6 – 9 months | 38 (18.9)  | 16 (42.1)               | 22 (57.9)      |         |
|                                   | > 9 months   | 31 (15.4)  | 20 (64.5)               | 11 (35.5)      |         |
| Use T.S.H Tablets                 | Yes          | 193 (96)   | 97 (50.3)               | 96 (49.7)      | 0.036   |
|                                   | No           | 8 (4)      | 1 (12.5)                | 7 (87.5)       |         |
| Use T.S.H Injections <sup>a</sup> | Yes          | 69 (34.8)  | 61 (88.4)               | 8 (11.6)       | 0.000   |
|                                   | No           | 129 (65.2) | 36 (27.9)               | 93 (72.1)      |         |
| Level of T.S.H before Treatment   | Stable       | 39 (19.7)  | 28 (71.8)               | 11 (28.2)      | 0.001   |
|                                   | Not stable   | 162 (81.8) | 70 (43.2)               | 92 (56.8)      |         |
| Level of T.S.H after Treatment    | Stable       | 104 (51.7) | 40 (38.5)               | 64 (61.5)      | 0.002   |
|                                   | Not stable   | 97 (48.3)  | 58 (59.8)               | 39 (40.2)      |         |

a. associated with gender; b. associated with age; c. associated with BMI; d. associated with duration of disease ( $p < 0.05$ )

**Table 2. Descriptive and inferential statistics of functional limitations of thyroid patients and types of thyroid disorder**

|  |                | N          | Type of Thyroid Disease |                | P-Value |
|--|----------------|------------|-------------------------|----------------|---------|
|  |                |            | Hyperthyroidism         | Hypothyroidism |         |
| Speedup in Metabolic System <sup>b,d</sup> | Yes            | 109 (54.2) | 32 (29.1)               | 78 (70.9)      | 0.000   |
|  | No             | 91 (46.8)  | 66 (72.5)               | 25 (27.5)      |         |
| The slowdown in Metabolic System           | Yes            | 82 (40.8)  | 59 (72.0)               | 23 (28.0)      | 0.000   |
|  | No             | 119 (59.2) | 39 (32.8)               | 80 (67.2)      |         |
| Effect on Weight <sup>a,c,d</sup>          | Weight gain    | 103(51.2)  | 25 (24.3)               | 78 (75.7)      | 0.000   |
|  | Weight Loss    | 76(37.8)   | 60 (78.9)               | 16 (21.1)      |         |
|  | No Effect      | 22 (10.9)  | 13 (59.1)               | 9 (40.9)       |         |
| Effect on Heartbeat <sup>b,c</sup>         | Heartbeat Fast | 102 (50.7) | 65 (63.7)               | 37 (36.3)      | 0.000   |
|  | Heartbeat Slow | 62 (30.8)  | 15 (24.2)               | 47 (75.8)      |         |
|  | No Effect      | 37 (18.4)  | 18 (48.6)               | 19 (51.4)      |         |
| Effect on Blood pressure <sup>a,c,d</sup>  | Increase in BP | 65 (32.3)  | 47 (72.3)               | 18 (27.7)      | 0.000   |
|  | Decrease in BP | 95 (47.3)  | 25 (26.3)               | 70 (73.7)      |         |
|  | No Effect      | 41 (20.4)  | 26 (63.4)               | 15 (36.6)      |         |
| Mood Swings <sup>a</sup>                   | Yes            | 157 (78.1) | 77 (49.0)               | 80 (51.0)      | 0.877   |
|  | No             | 44 (21.9)  | 21 (47.7)               | 23 (52.3)      |         |
| Fatigue                                    | Yes            | 193 (96.0) | 96 (49.7)               | 97 (50.3)      | 0.170   |
|  | No             | 8 (4.0)    | 2 (25.0)                | 6 (75.0)       |         |

|   |     | N          | Type of Thyroid Disease |                | P-Value |
|---|-----|------------|-------------------------|----------------|---------|
|   |     |            | Hyperthyroidism         | Hypothyroidism |         |
| Depression <sup>b,d</sup>                           | Yes | 91 (45.3)  | 42 (46.2)               | 49 (53.8)      | 0.502   |
|   | No  | 110 (54.7) | 56 (50.9)               | 54 (49.1)      |         |
| Weakness in Muscles <sup>b,d</sup>                  | Yes | 178 (88.6) | 80 (44.9)               | 98 (55.1)      | 0.003   |
|   | No  | 23 (11.4)  | 18 (78.3)               | 5 (21.7)       |         |
| Constipation <sup>a,b</sup>                         | Yes | 96 (47.8)  | 29 (30.2)               | 67 (69.8)      | 0.000   |
|   | No  | 104 (51.7) | 69 (65.7)               | 36 (34.3)      |         |
| Irregularities in sleep cycle <sup>a,c,d</sup>      | Yes | 81 (40.5 ) | 51 (63.0)               | 30 (37.0)      | 0.002   |
|   | No  | 119 (59.5) | 46 (38.7)               | 73 (61.3)      |         |
| Breathing Difficulties <sup>a</sup>                 | Yes | 117 (58.2) | 60 (51.3)               | 57 (48.7)      | 0.398   |
|   | No  | 84 (41.8)  | 38 (45.2)               | 46 (54.8)      |         |
| Coldness <sup>a,c,d</sup>                           | Yes | 118 (58.7) | 30 (25.4)               | 88 (74.6)      | 0.000   |
|   | No  | 83 (41.3)  | 68 (81.9)               | 15 (18.1)      |         |
| Difficulties in Routine Activities <sup>a,c,d</sup> | Yes | 63 (31.7)  | 27 (42.9)               | 36 (57.1)      | 0.527   |
|   | No  | 135 (67.8) | 70 (51.5)               | 66 (48.5)      |         |
| Irregularities in Menstrual Cycle <sup>d</sup>      | Yes | 98 (71.0)  | 31 (31.6)               | 67 (68.4)      | 0.000   |
|   | No  | 40 (29.0)  | 23 (57.5)               | 17 (42.5)      |         |
| Problems in Pregnancy                               | Yes | 77 (60.6)  | 27 (35.1)               | 50 (64.9)      | 0.002   |
|   | No  | 50 (39.4)  | 24 (48.0)               | 26 (52.0)      |         |
| Enlargement in Thyroid Gland <sup>a,c</sup>         | Yes | 90 (44.8)  | 83 (92.2)               | 7 (7.8)        | 0.000   |
|   | No  | 111 (55.2) | 15 (13.5)               | 96 (86.5)      |         |
| Surgery for Thyroid Gland <sup>c</sup>              | Yes | 45 (22.5)  | 39 (86.7)               | 6 (13.3)       | 0.000   |
|   | No  | 155 (77.5) | 59 (38.1)               | 96 (61.9)      |         |
| Satisfied with Health <sup>a</sup>                  | Yes | 112 (55.7) | 54 (48.2)               | 58 (51.8)      | 0.863   |
|   | No  | 89 (44.3)  | 44 (49.4)               | 45 (50.6)      |         |

a. associated with gender; b. associated with age; c. associated with BMI; d. associated with duration of disease (p<0.05)

Effect on heartbeat is also associated with age and BMI. The blood pressure of the patients had an increased nature among hyperthyroid patients and reportedly decreased among hypothyroid cases [26]. The blood pressure due to thyroid disorder is also associated with gender, BMI, and duration of the disease. In females, blood pressure comparatively decreases than the male. In normal-weight patients, blood pressure has been of increased nature whereas beyond normal weight it is of decreased nature. Fatigue, depression, and mood swings found no association with the type of thyroid disorder, and both are almost equally distributed between hypothyroid and hyperthyroid cases. Depression is positively associated with the age and duration of the disease. Hypothyroid cases felt more weakness in their muscles as compared to hyperthyroid patients. Weakness in muscles is also associated with the age and duration of the disease. Hypothyroid patients faced more constipation problems than hyperthyroid, and this problem of constipation is associated with gender and age. Female patients were more at risk of constipation than the male [27]. Hyperthyroid patients were more at risk of irregularities in the sleep cycle than in the hypothyroid cases whereas difficulties in breathing were equally distributed between both types of thyroid disorder but more among women. An irregularity in the sleep cycle is also associated with gender, BMI, and duration of the disease. Hypothyroid cases felt colder when others do not than the hyperthyroid patients. This coldness is also associated with gender, BMI, and duration of the disease. Women and heavyweight patients were more at risk of coldness. Difficulties in routine activities were not associated with the type of thyroid disease but with the gender, BMI, and duration of the disease. Female faced more difficulties in their routine activities than the male. Irregularities in the menstrual cycle and problems in pregnancy were significantly higher in hypothyroidism than the hyperthyroidism. In the early stage of the disease, menstrual cycle problems were higher than the later stage of the disease. Men faced more problems of enlargement of the thyroid gland than women and the enlargement of the thyroid gland also has been associated with BMI. Hyperthyroid and overweight patients faced surgery for their enlarged thyroid glands. The level of TSH before treatment is more stable in hyperthyroidism whereas after treatment it is more stable in hypothyroidism [28-32]. Finally, both hyper and hypothyroid patients were almost equally satisfied with their health.

## 5. CONCLUSION

Lopsidedness in the direction of thyroid organ hormones can bring about many issues that range from a little goiter to life undermining ailments, for example, thyroid tumor. Female, age over 30 years, married, overweight, family size of less than four, family history of brothers and sisters and persons use iodized salt are more at risk of hypothyroidism and may face the problems like speedup in the metabolic system, weight gain, slow heartbeat, low blood pressure, weakness in muscles, constipation, coldness when others do not, difficulties in routine activities, irregularities in the menstrual cycle and problems in pregnancy. So, by considering all this evidence, early diagnosis and precautionary steps are essential to avoid the prevalence of thyroid disease specifically in the cases of women.

Since in most of cases people do not come with their antibody tests or may unavailability of these tests is the limitation of this study.

## CONSENT

Verbal and written consent was taken from the outdoor patients to participate in the research before collecting the information.

## ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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