Prevalence of Subclinical Hypothyroidism in an Otherwise Healthy Population– A Study

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ABSTRACT
Subclinical hypothyroidism (SCH) is an early stage of hypothyroidism and is usually detected in patients who had thyroid function testing performed due to symptoms of hypothyroidism. The elevated TSH level and decrease level of free T4 level is called subclinical hypothyroidism. This condition occurs in 3% to 8% of the general population affecting more women than men and its prevalence also increases with the age. The symptoms are difficult to diagnose and if these symptoms are noticed, it tend to be vague and general such as weight gain, fatigue, hair loss, constipation, goiter and memory problems with brain fog.

A questionnaire was designed asking a set of questions which included the history of hypothyroidism, does the person suffer from any other lifestyle disorder etc. The questionnaire was filled by interviewing the patients who came for regular checkups.

Out of the total 155 patients 32% of them suffered from SCH.

The analysis of survey shows that females and elderly population were most affected by subclinical hypothyroidism.

Keywords- Subclinical hypothyroidism, Fatigue, Brain fog, Hypothyroidism.

I. INTRODUCTION

Subclinical hypothyroidism (SCH) is when a serum thyroid-stimulating hormone (TSH) level rises above the upper limit of serum-free thyroxine. Subclinical hypothyroidism or mild thyroid failure is a common problem, with a prevalence of 3% to 8% population without knowing that the patients are suffering from thyroid disease[1]. The subclinical hypothyroidism is caused by the same disorders of the thyroid gland as those that cause overt hypothyroidism. SCH is characterized by the elevated TSH levels with normal levels of FT3 and FT4[2].

The only way to diagnose this type of disorder is by biochemical testing because the clinical results shows a lot of variation. As per the literature, it has been reported that the prevalence of SCH is more common in females then males and also this disorder increases with the age[3]. There are a number of consequences of SCH which includes the increased risk of cardiovascular diseases, lead to sub fertility, low birth weight and also miscarriages. The symptoms of Subclinical hypothyroidism are difficult to diagnose and the complaints from the patients are also non-specific such as memory impairment, weakness, tiredness, hair loss, dry skin and many other symptoms that are similar to overt hypothyroidism[4].

II. MATERIALS AND METHODS

1.1. Survey Development
A questionaire was prepared with about 15 questions in the respect to interview the patients. The methods that were followed is shown in Figure 1.

Figure 1: Steps followed for subclinical hypothyroidism
1.2. Interviewing The Patients
The survey was performed on patients who visited the hospital for regular check-ups. The questionnaire was prepared and the patients were asked various questions such as do they smoke or not, if they have any family history of thyroid, if they are suffering from any other disease etc. Total of 155 patients were interviewed and their data was combined for further analysis. After the successful completion of interviewing the patients the next step is the blood sampling which states the results of subclinical hypothyroidism.

1.3. Sample Collection
Blood sampling or blood collection is an essential procedure in modern medicine. Venous blood collection was done where the blood is taken from the vein because veins are close to the surface of the skin. This makes the process easier by avoiding a deep needle plunge just to draw a bit of blood. Moreover, the walls of veins are thinner than arteries. The blood pressure in veins is less than that in arteries. Minute quantities of blood can be taken from veins by pricking the skin[5].

The evacuated tube system for blood collection was used for various laboratory tests which consist of tubes of various color coded tops indicating tube contents. The different colour evacuated tubes used were red, grey, blue, black, lavender, green and yellow is shown in Figure 2. The samples of patients were tested. The data was collected and analyzed to see the number of patients who suffered from subclinical hypothyroidism in a given population.

Figure 2: The different colour evacuated tube

III. RESULTS
The patients data is further analyzed based on the values obtained from the biochemical testing. With the elevated TSH level and normal range of T4 then this disorder is called Subclinical hypothyroidism. As shown in Table No.1and Graph No. 1the data of 18-30 of females is recorded and the highlighted rows depicts the results of females suffering from subclinical hypothyroidism with elevated TSH level and normal T4 level. Total 20 females were interviewed and their biochemical testing was performed out of which 30% females are suffering from SCH. According to the literature it has been observed that SCH are more common in females of reproductive age and can also affect the conception and pregnancy[6].

Table 1: Patients summary of subclinical hypothyroidism from 18 to 30 years female

| S.NO | AGE (YEARS) | TSH (0.27-4.20) uIU/mL | T3 (2.00-4.40) pg/mL | T4 (0.93-1.70) ng/dL |
|------|-------------|------------------------|----------------------|----------------------|
| 1    | 18          | 1.8                    | 3.09                 | 1.01                 |
| 2    | 18          | 4.06                   | 2.59                 | 1.44                 |
| 3    | 19          | 8.7                    | 4.31                 | 1.39                 |
| 4    | 19          | 3.01                   | 4.1                  | 1.22                 |
| 5    | 21          | 1.46                   | 3.63                 | 1.67                 |
| 6    | 22          | 3.47                   | 2.83                 | 1.2                  |
| 7    | 22          | 169.9                  | 0.66                 | 0.09                 |
| 8    | 23          | 6.12                   | 3.39                 | 1.15                 |
The graph depicts the 18-30 years of female population who suffered from SCH. The data of patients were separated according to the gender and age groups. The Table No. 2 and Graph No. 2 shows the patients data of males aged between 18 to 30 years. Total of 10 samples were collected and biochemical testing were done and the results were 30% of population were SCH sufferers. As reported by clinical evaluations and surveys 30% males were affected may be of reduction in serum testosterone level.

Table 2: Patients summary of subclinical hypothyroidism from 18 to 30 years male

| S.NO | AGE (YEARS) | TSH (0.27-4.20) ulU/mL | T3 (2.00-4.40) pg/mL | T4 (0.93-1.70) ng/dL |
|------|-------------|------------------------|----------------------|----------------------|
| 1    | 19          | 2.12                   | 6.12                 | 10.6                 |
| 2    | 24          | 2.92                   | 3.73                 | 1.57                 |
| 3    | 25          | 4.03                   | 3.79                 | 1.51                 |
| 4    | 27          | 6.05                   | 3.02                 | 1.14                 |
| 5    | 27          | 4.96                   | 4.07                 | 1.26                 |
| 6    | 28          | 1.95                   | 3.55                 | 1.51                 |
| 7    | 29          | 3.33                   | 4.38                 | 1.74                 |
| 8    | 29          | 5.9                    | 4.59                 | 1.9                  |
| 9    | 29          | 1.3                    | 3.15                 | 1.44                 |
| 10   | 30          | 4.6                    | 4.19                 | 1.56                 |
Graph 2: The graph depicts the 18-30 years of male population who suffered from SCH

The Table No. 3 and Graph No. 3 shows the data of males that were between the age group of 30 to 60 years. Total 50 patients data was collected and the results showed that 32% of males were suffering from SCH. As per interviewing the patients complaints about the non-specific symptoms that were fatigue, constipation etc.

Graph 3: The graph depicts the 30-60 years of male population who suffered from SCH
Table 3: Patients summary of subclinical hypothyroidism from 30 to 60 years of male

| S.NO | AGE (YEARS) | TSH (0.27-4.20) uU/mL | T3 (2.00-4.40) pg/mL | T4 (0.93-1.70) ng/dL |
|------|-------------|------------------------|----------------------|----------------------|
| 1    | 33          | 1.69                   | 3.46                 | 1.53                 |
| 2    | 35          | 1.81                   | 3.12                 | 1.14                 |
| 3    | 40          | 5.78                   | 3.11                 | 1.52                 |
| 4    | 40          | 1.9                    | 3.92                 | 1.62                 |
| 5    | 43          | 8.54                   | 3.22                 | 1.54                 |
| 6    | 44          | 2.56                   | 2.93                 | 1.52                 |
| 7    | 46          | 0.878                  | 3.35                 | 1.26                 |
| 8    | 46          | 5.56                   | 3.52                 | 1.22                 |
| 9    | 47          | 2.15                   | 3.43                 | 1.13                 |
| 10   | 47          | 2.89                   | 3.44                 | 0.84                 |
| 11   | 48          | 5.59                   | 3.66                 | 1.14                 |
| 12   | 48          | 4.19                   | 3.8                  | 1.27                 |
| 13   | 49          | 1.75                   | 4.21                 | 1.51                 |
| 14   | 49          | 1.83                   | 3.11                 | 1.22                 |
| 15   | 49          | 9.17                   | 2.94                 | 0.903                |
| 16   | 50          | 2.11                   | 3.77                 | 1.37                 |
| 17   | 50          | 5.59                   | 3.56                 | 1.21                 |
| 18   | 50          | 4.68                   | 3.48                 | 1.04                 |
| 19   | 50          | 1.91                   | 2.85                 | 1.36                 |
| 20   | 50          | 5.53                   | 3.31                 | 1.26                 |
| 21   | 51          | 2.76                   | 2.87                 | 1.53                 |
| 22   | 51          | 3.63                   | 3.18                 | 1.18                 |
| 23   | 51          | 0.53                   | 3.56                 | 1.31                 |
| 24   | 51          | 2.41                   | 3.4                  | 1.41                 |
| 25   | 52          | 2.85                   | 3.24                 | 1.43                 |
| 26   | 52          | 2.22                   | 3.48                 | 1.18                 |
| 27   | 53          | 2.82                   | 4.35                 | 1.49                 |
| 28   | 53          | 6.38                   | 3.15                 | 0.965                |
| 29   | 54          | 4.52                   | 3.17                 | 1.37                 |
| 30   | 54          | 2.59                   | 3.1                  | 1.3                  |
| 31   | 54          | 11.27                  | 3.56                 | 1.81                 |
| 32   | 54          | 2.58                   | 2.94                 | 1.1                  |
| 33   | 54          | 2.58                   | 3.64                 | 1.54                 |
| 34   | 54          | 3.13                   | 3.46                 | 1.1                  |
| 35   | 55          | 3.74                   | 3.34                 | 1.1                  |
| 36   | 55          | 6.45                   | 2.83                 | 0.9                  |
| 37   | 56          | 4.9                    | 3.77                 | 1.45                 |
| 38   | 56          | 9.61                   | 4                    | 1.15                 |
| 39   | 57          | 3.13                   | 3.15                 | 1.57                 |
| 40   | 57          | 1.08                   | 3.77                 | 1.64                 |
| 41   | 57          | 3.76                   | 3.68                 | 1.24                 |
| 42   | 58          | 2.66                   | 3.2                  | 1.26                 |
| 43   | 58          | 7.58                   | 3.95                 | 1.18                 |
| 44   | 58          | 7.38                   | 3.2                  | 1.04                 |
| 45   | 59          | 2.26                   | 4.1                  | 1.44                 |
| 46   | 59          | 9.85                   | 2.63                 | 1.06                 |
| 47   | 59          | 2.29                   | 3.47                 | 1.06                 |
| 48   | 59          | 1.13                   | 3.43                 | 1.24                 |
| 49   | 60          | 4.62                   | 3.22                 | 1                   |
| 50   | 60          | 0.99                   | 3.32                 | 1.4                  |
The Table No.4 and Graph No. 4 shows the data off males that were between the age group of 30 to 60 years. Total of 50 female patients were interviewed out of which 36% were suffering from subclinical hypothyroidism. As per the reported literature the prevalence of SCH is more in women as compared to men[7].

Table 4: Patients summary of subclinical hypothyroidism from 30 to 60 years of female

| S.NO | TSH (0.27-4.20) uIU/mL | T3 (2.00-4.40) pg/mL | T4 (0.93-1.70) ng/dL |
|------|-------------------------|----------------------|---------------------|
| 1    | 1.57                    | 3.28                 | 1.27                |
| 2    | 0.49                    | 3.16                 | 0.95                |
| 3    | 0.81                    | 3.05                 | 1.52                |
| 4    | 0.57                    | 3.27                 | 1.14                |
| 5    | 6.38                    | 2.99                 | 1.12                |
| 6    | 3.53                    | 3.78                 | 1.17                |
|   |     |     |     |
|---|-----|-----|-----|
|   | 7   | 2.56| 2.75| 1.21|
|   | 8   | 1.38| 3.33| 0.89|
|   | 9   | 1.93| 3.18| 1.31|
|   | 10  | 2.17| 3.29| 1.17|
|   | 11  | 6.04| 3.3 | 1.04|
|   | 12  | 7.43| 2.57| 0.9 |
|   | 13  | 3   | 3.28| 1.44|
|   | 14  | 4.51| 2.67| 1.26|
|   | 15  | 4.37| 3.82| 1.61|
|   | 16  | 3.79| 2.95| 1.56|
|   | 17  | 4.92| 3.52| 1.39|
|   | 18  | 3.84| 2.52| 0.819|
|   | 19  | 2.01| 2.6 | 1.05|
|   | 20  | 3.23| 2.72| 0.996|
|   | 21  | 1.47| 2.88| 1.31|
|   | 22  | 2.65| 2.89| 1.29|
|   | 23  | 4.91| 3.07| 1.08|
|   | 24  | 3.06| 2.83| 1.48|
|   | 25  | 2.94| 3.39| 1.38|
|   | 26  | 3.59| 3.27| 1.12|
|   | 27  | 0.32| 2.98| 1.34|
|   | 28  | 3.83| 2.81| 1.29|
|   | 29  | 1.67| 3.19| 1.44|
|   | 30  | 7.08| 2.66| 1.21|
|   | 31  | 5.89| 2.57| 0.96|
|   | 32  | 8.03| 3.53| 1.17|
|   | 33  | 1.81| 2.87| 1.18|
|   | 34  | 4.92| 2.2 | 1.14|
|   | 35  | 5.64| 2.91| 0.793|
|   | 36  | 6.08| 3.09| 1.17|
|   | 37  | 1.8 | 3.52| 1.23|
|   | 38  | 1.57| 2.88| 1.24|
|   | 39  | 7.25| 4.02| 1.37|
|   | 40  | 6.47| 2.75| 0.9 |
|   | 41  | 2.14| 2.89| 0.94|
|   | 42  | 3.41| 3.87| 1.52|
|   | 43  | 4.65| 3   | 1.31|
|   | 44  | 2.28| 2.85| 1.62|
|   | 45  | 19.78| 2.99| 1.1 |
|   | 46  | 4.36| 3.42| 1.29|
|   | 47  | 3.96| 2.83| 1.48|
|   | 48  | 2.06| 3.11| 1.61|
|   | 49  | 4.47| 2.59| 0.934|
|   | 50  | 1.96| 2.91| 1.56|
The Table No. 5 and Graph No. 5 shows the data of male population that were above the age of 60 years. Total 15 male patients data was collected and testing was performed. According to which 20% of the population aged above 60 years were suffering from SCH. As per clinical data it has been reported that the prevalence increases with age[8].

**Table 5: Patients summary of subclinical hypothyroidism above 60 years male**

| S.NO | AGE (yrs) | TSH (0.27-4.20) uIu/mL | T3 (2.00-4.40) pg/mL | T4 (0.93-1.70) ng/dL |
|------|-----------|------------------------|----------------------|----------------------|
| 1    | 61        | 7.27                   | 2.93                 | 1.08                 |
| 2    | 62        | 1.17                   | 2.97                 | 1.91                 |
| 3    | 62        | 5.95                   | 3.35                 | 1.14                 |
| 4    | 62        | 4.84                   | 2.98                 | 0.917                |
| 5    | 62        | 5.29                   | 2.95                 | 0.89                 |
| 6    | 62        | 5.15                   | 2.64                 | 0.84                 |
| 7    | 63        | 3.48                   | 3.38                 | 1.22                 |
| 8    | 64        | 1.68                   | 7.74                 | 1.42                 |
| 9    | 64        | 3.46                   | 3.44                 | 1.2                  |
| 10   | 65        | 2.68                   | 3.5                  | 1.51                 |
| 11   | 66        | 1.7                    | 1.6                  | 0.974                |
| 12   | 67        | 14.01                  | 3.09                 | 1.39                 |
| 13   | 67        | 4.02                   | 2.54                 | 1.17                 |
| 14   | 68        | 1.14                   | 1.99                 | 1.26                 |
| 15   | 82        | 0.41                   | 1.88                 | 0.97                 |

**Graph 5: The levels of TSH of male population above 60 years of age**

The Table No. 6 and Graph No.6 shows the data of females that were above the age of 60 years. Total 10 female patients were interviewed out of which 50 % were suffering from subclinical hypothyroidism. While interviewing the female patients they were having complaints such as hair loss problems, they get tired easily, pain in knees etc. It has been observed that it is more common in women than men, and its prevalence increases with age[8].
Table 6: Patients summary of subclinical hypothyroidism above 60 years female

| S.NO | AGE (YEARS) | TSH (0.27-4.20) ulU/mL | T3 (2.00-4.40) pg/mL | T4 (0.93-1.70) ng/dL |
|------|-------------|------------------------|----------------------|----------------------|
| 1    | 62          | 3.77                   | 2.52                 | 1.36                 |
| 2    | 63          | 1.64                   | 3.2                  | 1.39                 |
| 3    | 63          | 4.56                   | 2.81                 | 1.15                 |
| 4    | 65          | 9.86                   | 1.81                 | 1.14                 |
| 5    | 65          | 4.58                   | 2.73                 | 1.2                  |
| 6    | 65          | 2.36                   | 3.31                 | 1.46                 |
| 7    | 67          | 4.47                   | 2.97                 | 1.27                 |
| 8    | 73          | 5.16                   | 2.75                 | 1.22                 |
| 9    | 74          | 5.62                   | 2.47                 | 1.25                 |
| 10   | 84          | 2.04                   | 0.93                 | 1.35                 |

Graph 6: The levels of TSH of female population above 60 years of age

IV. CONCLUSION AND DISCUSSION

Table 7: The results of the subclinical hypothyroidism

| S. NO | AGE             | GENDER | RESULTS OF SCH          |
|-------|-----------------|--------|-------------------------|
| 1.    | 18 to 30 years  | Male   | 30 % were suffering from SCH |
| 2.    | 18 to 30 years  | Female | 30 % were suffering from SCH |
| 3.    | 30 to 60 years  | Male   | 32 % were suffering from SCH |
| 4.    | 30 to 60 years  | Female | 36 % were suffering from SCH |
| 5.    | Above 60 years  | Male   | 20 % were suffering from SCH |
| 6.    | Above 60 years  | Female | 50 % were suffering from SCH |
SCH is frequently seen in the population, but is often asymptomatic or there are vague symptoms that lead to the diagnosis being missed. Patients may present with symptoms similar to hypothyroidism and this warrants a full thyroid check-up. Subclinical hypothyroidism is defined as an elevated serum TSH level associated with normal total or free T₄ and T₃ values. As per the results collected through the survey the prevalence was found more in elderly population and in women. The study indicated the following results such as 30 % of female population age between 18-30 years suffered from SCH. The 36 % female population between 30 to 60 years were suffering from SCH and above 60 years 50% were the SCH sufferers.

If we talk about the male population age between 18-30 years, 30% were suffering from SCH. 32% males between age 30-60 years were suffering from SCH and only 20 % of them suffered from this disorder above 60 years of age. From this study it has been concluded that females are more prevalent to this disorder as compared to males. Moreover the SCH increases with age depending on many factors and non-specific symptoms.

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CONFLICT OF INTEREST

NONE

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