ASSESSMENT OF MEDICATION ADHERENCE AMONG PATIENTS WITH THYROID DYSFUNCTION IN A TERTIARY CARE CENTRE – A PROSPECTIVE OBSERVATIONAL STUDY

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ABSTRACT

The thyroid gland produces the hormones thyroxin, tri-iodothyronine and calcitonin. These hormones are responsible for regulating growth and development through rate of metabolism. Over/under production of thyroid hormones results in different types of diseases mainly hyperthyroidism and hypothyroidism. Patient medication adherence is an important factor in determining the treatment outcome of any disease. Poor adherence has been found to be associated with development of complications, disease progression, premature disability and death. The aim of this study was to assess the magnitude of adherence and the factors associated with non-adherence to thyroid medication in 273 patients attended the OPD of General Medicine, Govt. Medical College, Thiruvananthapuram, were interviewed using Morisky-8-item and Brief Medication questionnaires for a period of six months. Most of the patients were females and belongs to the age group of 21-50 years. The overall adherence level was found to be 30% according to Morisky-8- item questionnaire and 30.4% according to BMQ. The study also identified that forgetfulness, felt better and stopped, cost of medication and lack of access to drug store/hospital were the major reasons behind non-adherence to medication.

KEYWORDS: Adherence, Hyperthyroidism, Hypothyroidism, Non-adherence, T₄.
INTRODUCTION
The thyroid gland is a butterfly shaped organ located in the base of the neck. The thyroid gland produces the hormones thyroxine, tri-iodothyronine and calcitonin. These hormones are responsible for regulating growth and development through rate of metabolism. The thyroid hormones regulate vital body functions including breathing, heart rate, central and peripheral nervous systems, body weight, muscle strength, menstrual cycles, body temperature, cholesterol level etc.[1, 2]

An over production of the thyroid hormone T3 or T4 or both results in hyperthyroidism. It presents with symptoms such as thyroid goitre, protruding eyes (exophthalmos), palpitations, excess sweating, diarrhoea, weight loss, muscle weakness and unusual sensitivity to heat and increased appetite. The underproduction of the thyroid hormone T3 or T4 or both results in hypothyroidism. Typical symptoms are abnormal weight gain, tiredness, baldness, cold intolerance and bradycardia.[1, 2]

The best way to initially test thyroid function is to measure the TSH level in a blood sample. A high TSH level indicates that the thyroid gland is failing because of a problem that is directly affecting the thyroid (primary hypothyroidism). The opposite situation, in which the TSH level is low, usually indicates that the person has an overactive thyroid that is producing too much thyroid hormone (hyperthyroidism). In most healthy individuals, a normal TSH value means that the thyroid is functioning normally.[1-3]

The free T4 fraction is the most important to determine how the thyroid is functioning, and tests to measure this are called the Free T4 (FT4) and the Free T4 Index (FT4I or FTI). T3 tests are often useful to diagnosis hyperthyroidism or to determine the severity of the hyperthyroidism. Measuring levels of thyroid antibodies may help diagnose the cause of the thyroid problems. Tg test is used most often in patients who have had surgery for thyroid cancer in order to monitor them after treatment. By measuring the amount of radioactive iodine taken up by the thyroid gland (radioactive iodine uptake, RAIU), the physicians can determine whether the gland is functioning normally.[1-3, 7]

Beta blockers (Atenolol, Propranolol) are used to decrease symptoms of hyperthyroidism such as increased heart rate, tremors, anxiety and heart palpitations and anti-thyroid drugs (Carbimazole, Propyl thiouracil) are used to decrease the production of thyroid hormones. Due to side effects and inconvenience of such drug regimens, some patients choose to undergo radioactive iodine131 treatment. Hypothyroidism is treated with hormone
replacement therapy, such as levothyroxine, which is typically required for the rest of the patient’s life.\textsuperscript{[1-3, 7, 9]}

Medication adherence is defined as the extent to which a patient’s medication taking behaviour coincides with the intention of the health advice he or she has been given. Medication adherence is one of the most important factors that determine therapeutic outcomes. Non-adherence is a common problem among patients with thyroid disorders. Our aim was to conduct a study under various objectives like assessment of medication adherence and its reason in thyroid patients. The study was carried out at the Department of General Medicine Govt. Medical College Hospital, Thiruvananthapuram, a tertiary care Teaching Hospital.\textsuperscript{[4]}

MATERIALS AND METHODS
Data collection was done from December 2015 to June 2016, at Department of General Medicine, Govt. Medical College Hospital, Thiruvananthapuram.

STUDY DESIGN
A prospective observational study was conducted on thyroid patients to assess their medication adherence and reason for non-adherence by using standard questionnaires.

SAMPLE POPULATION
Patients diagnosed with Thyroid dysfunction attending to the Department of General Medicine, Govt. Medical College Hospital, Thiruvananthapuram.

SAMPLE SIZE
273 patients.

INCLUSION CRITERIA
Patients diagnosed with thyroid dysfunction.

EXCLUSION CRITERIA
- Patients who are currently taking Lithium or Steroid medications.
- Patients with congenital abnormalities.
- Patients with thyroid cancers.

STUDY PROCEDURE
A Written informed consent was taken from the patient or caregiver in a prescribed format. Patients who met the inclusion criteria were enrolled for the study. The baseline measures
such as patient demographics, co-morbidities, co-medications and lab values were recorded in prescribed format. Medication adherence was assessed using Morisky-8-item medication adherence questionnaire and Brief Medication Adherence Questionnaire. After taking baseline measurements proper counseling was given to the patients about medication. Finally the results obtained were assessed and interpreted using statistical software.

**PLAN OF ANALYSIS**

Analysis of results was done by using SPSS software (Version 17.0). The descriptive variables such as mean and standard deviations were used. Bar and pie charts were used to present percentage distribution of selected variables in the study.

**RESULTS**

A total of 273 patients who satisfied the inclusion criteria were enrolled in the study.

**Table 1: Distribution of patients according to Age**

<table>
<thead>
<tr>
<th>Age in years</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 20</td>
<td>15</td>
<td>5.5</td>
</tr>
<tr>
<td>21 – 30</td>
<td>73</td>
<td>26.7</td>
</tr>
<tr>
<td>31 – 40</td>
<td>68</td>
<td>24.9</td>
</tr>
<tr>
<td>41 – 50</td>
<td>70</td>
<td>25.6</td>
</tr>
<tr>
<td>51 – 60</td>
<td>34</td>
<td>12.5</td>
</tr>
<tr>
<td>&gt;60</td>
<td>13</td>
<td>4.8</td>
</tr>
<tr>
<td>Total</td>
<td>273</td>
<td>100.0</td>
</tr>
</tbody>
</table>

According to the results, it was identified that the highest frequency of patients having thyroid dysfunction were between 21-50 years of age (77.2%).

![Figure 1: Distribution of patients according to Gender](image)
In the study population, it was found that 93.8% patients were female and 6.2% were male.

![Figure 2: Distribution of patients according to BMI](image)

It was observed that, out of the total study population majority of the patients were with normal weight (55.3%). Percentages of overweight and obese patients were 35.5% and 9.2% respectively.

![Figure 3: Distribution of patients according to socio-economic status](image)

From the study it was found that most of the patients were from low income family group (65.6%) and remaining 34.4% were from middle income family group.

![Figure 4: Distribution of patients according to education](image)
It was observed that most of the study population (40.8%) had high school level of education, 23.1% had higher secondary level of education, 12.9% had degree or higher qualifications and 3.3% of the patients were illiterate.

![Food habit]

**Figure 5: Distribution of patients according to food habit**

From the study it was found that 98.9% of the study population was non-vegetarians and rest of them was vegetarians.

**Table 2: Distribution of patients according to Co-morbidity**

<table>
<thead>
<tr>
<th>Co-morbidity</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension</td>
<td>39</td>
<td>14.3</td>
</tr>
<tr>
<td>Diabetes Mellitus</td>
<td>22</td>
<td>8.1</td>
</tr>
<tr>
<td>Pregnancy</td>
<td>24</td>
<td>8.8</td>
</tr>
<tr>
<td>History of Radiation</td>
<td>27</td>
<td>9.9</td>
</tr>
<tr>
<td>Hyperlipidaemia</td>
<td>58</td>
<td>21.2</td>
</tr>
<tr>
<td>Liver Cirrhosis</td>
<td>1</td>
<td>0.4</td>
</tr>
<tr>
<td>Heart Diseases</td>
<td>5</td>
<td>1.8</td>
</tr>
</tbody>
</table>

From the study it was observed that majority of the population (21.2%) had hyperlipidaemia as co-morbidity, 14.3% of patients presented with hypertension, 8.1% presented with diabetes mellitus and 1.8% presented with heart diseases. In the study population 9.9% of the patients had a history of radiation to the neck. The percentage of patients having liver cirrhosis as co-morbidity was about 0.4%. None of the patients showed any kidney diseases. From the total population 93.8% of patients were females and out of which 8.8% were pregnant.

From the study majority of the patients were presented with hair loss (83.9%), fatigue (69.2%) and weight gain (50.5%). About 39.6% of patients had shortness of breath, 38.8% had appetite change and 29.7% had insomnia.
From the study population it was found that majority of the patients had thyroid disease for a period of 1-5 years and only 2.6% patients had a period of more than 20 years.

Table 3: Distribution of patients according to duration of thyroid disease

<table>
<thead>
<tr>
<th>Duration of thyroid disease</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 1 year</td>
<td>36</td>
<td>13.2</td>
</tr>
<tr>
<td>1-5 years</td>
<td>139</td>
<td>50.9</td>
</tr>
<tr>
<td>6-10 years</td>
<td>69</td>
<td>25.3</td>
</tr>
<tr>
<td>11-15 years</td>
<td>12</td>
<td>4.4</td>
</tr>
<tr>
<td>16-20 years</td>
<td>10</td>
<td>3.7</td>
</tr>
<tr>
<td>More than 20 years</td>
<td>7</td>
<td>2.6</td>
</tr>
<tr>
<td>Total</td>
<td>273</td>
<td>100.0</td>
</tr>
</tbody>
</table>

From the study population 51.6% of patients were under treatment for about 1-5 years, The study results revealed that majority of the patients (51.6%) were taking treatment for a period of 1-5 years and 2.6% were for more than 20 years.

Table 4: Distribution of patients according to duration of treatment

<table>
<thead>
<tr>
<th>Duration of treatment</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 1 year</td>
<td>37</td>
<td>13.6</td>
</tr>
<tr>
<td>1-5 years</td>
<td>141</td>
<td>51.6</td>
</tr>
<tr>
<td>6-10 years</td>
<td>67</td>
<td>24.5</td>
</tr>
<tr>
<td>11-15 years</td>
<td>12</td>
<td>4.4</td>
</tr>
<tr>
<td>16-20 years</td>
<td>9</td>
<td>3.3</td>
</tr>
<tr>
<td>More than 20 years</td>
<td>7</td>
<td>2.6</td>
</tr>
<tr>
<td>Total</td>
<td>273</td>
<td>100.0</td>
</tr>
</tbody>
</table>

In this study population, when medication adherence was evaluated by Morisky 8 item Medication Adherence Scale, it was found that 30% of patients showed high medication adherence. 34.8% and 35.2% of patients showed medium and low level of medication adherence respectively.
According to BMQ screen, 30.4% of the sample population were adherent to their regimen. 55.3%, 86.1% and 50.5% of patients showed adherence according to their belief, recall and access barrier screens respectively.

From the sample population, majority (45.1%) of the patients showed forgetfulness as the reason for non-adherence to medication in them. The percentages of sample showed financial problem, feelings of cure and side effects as the reason for non-adherence were found to be 8.8%, 8.1% and 0.4% respectively.

DISCUSSION
According to the results, it was identified that the highest frequency of patients having thyroid dysfunction were between 21-50 years of age (97.2%). Among them 26.7% belongs to age group of 21-30 years, 25.6% belongs to age group of 41-50 years and 24.9% belongs
to age group of 31-40 years. It may be due to the fact that the process of aging strongly affects the thyroid gland and results in functional changes.\[10\]

After analyzing the study results, it was concluded that the study population with thyroid dysfunction includes 93.8% of females and 6.2% of males. Women are more susceptible to different hormonal leaps. Their body is very sensitive to any hormonal changes and reacts to them sharper than the calm male body. This may be the reason for the female predominance than males.\[6\]

Study revealed that out 273 patients 55.3% of patients had normal weight, 35.5% had over weight and 9.2% of patients were obese. Thyroid dysfunction may or may not causes weight variations.\[7\]

Results of the study showed that majority of the patients with thyroid dysfunction were married (92.3%) when compared with minor percentage of unmarried population.

From the patients attending the Thyroid clinic, Department of General Medicine, majority was below poverty line (65.6%) and the rest (34.4%) were above poverty line. This being a Government health care facility treatment and medicines easily accessible and available free of cost to the economically backward class of the society. So most of the patients coming to our study settings were from financially poor family.

It was observed that most of the study population (40.8%) had high school level of education, 23.1% had higher secondary level of education, 12.9% had degree or higher qualifications and 3.3% of the patients were illiterate. The study results showed that most of the patients in our study were from rural area and they belong to BPL category. The lack of knowledge about the importance of education and the poor financial status may be the reason for the mentioned educational status in our sample population.

Study revealed that about 55% of study population was not having any associated co-morbidities. Most of the thyroid patients were from young age group and hence the chances of having co-morbidities are less in these age groups compared to high co-morbidity state seen in higher age groups. Out of the remaining, the main co-morbidities observed were hyperlipidaemia (21.2%), cardiovascular complications/ hypertension (16.6%) and diabetes (8.1%) which is common in higher age groups. Increased thyroid hormone levels stimulate fat metabolism leading to increased concentration of fatty acids in plasma. They also enhance
oxidation of fatty acids in many tissues. Thus plasma concentrations of cholesterol and triglycerides are inversely correlated with thyroid hormone levels. Thyroid hormones also stimulate all aspects of carbohydrate metabolism including enhancement of insulin dependent entry of glucose into cells and increased gluconeogenesis and glycogenolysis to generate free glucose. This will lead to increased plasma sugar concentration.[6-8]

It was observed that 8.8% of thyroid patients were pregnant and 9.9% had a history of radiation to the neck. Pregnant women are the most sensitive to iodine deficiency, as during this period the women’s hormonal system undergoes serious challenge. Besides by 16-17th week the foetus begins to develop its own thyroid gland and it begins to take iodine from mother. This may be the cause of thyroid dysfunction in pregnant women. Radiation to the neck can often lead to impaired thyroid function as it may damage the pituitary gland and which intern affects TSH secretion. So radiation when delivered to the neck causes thyroid disease (hypothyroidism).[6, 8]

From the study population it was found that majority of the patients had thyroid disease for a period of 1-5 years and only 2.6% patients had a period of more than 20 years. The study results showed that most of the patients were non-adherent to their treatment as well as the disease condition i.e., they do not follow their prescription accordingly. This may increase the course of disease and is the reason for long disease duration in our study population.[6, 8]

The study results revealed that majority of the patients (51.6%) were taking treatment for a period of 1-5 years and 2.6% were for more than 20 years. The reason for long treatment duration may be the non-adherent nature of the patient.[6, 8]

The thyroid hormones play a major role in growth, mental development and help to regulate the body’s metabolism. So their deficiency as well as excessiveness results in a set of different complications. The decreased level of thyroid hormone in hypothyroidism results in hair loss, weight gain, appetite change etc. and increased level in hyperthyroidism results in shortness of breath, insomnia etc. Fatigue is common in both hypo and hyperthyroidism. So our study population showed the above mentioned features as major complications.[6, 8]
ASSESSMENT OF MEDICATION ADHERENCE BY MORISKY-8-ITEM MEDICATION QUESTIONNAIRE\textsuperscript{[9]}

When the medication adherence was evaluated using MMAS-8, it was found that patients with high, medium and low adherence were around 30.0\%, 34.8\% and 35.2\% respectively.

ASSESSMENT OF MEDICATION ADHERENCE BY BRIEF MEDICATION QUESTIONNAIRE\textsuperscript{[9]}

\textit{Regimen screen}

The score of questionnaire highlights that the presence of adherence in patients with thyroid dysfunction in regimen screen was found to be about 30.4\% and non-adherence was found to be 69.2\%. The results showed that majority of patients were not following the prescribed regimen and experiencing some barriers to follow the medication.

\textit{Belief screen}

A score of zero indicate adherence and greater than zero indicate positive screen for non-adherence. Our study showed that 55.3\% had belief barriers.

\textit{Recall screen}

A score of zero indicate adherence and greater than zero indicates positive screen for non-adherence. From the table 17 recall barriers were present in 13.9\% of study population.

\textit{Access barrier screen}

A score of zero indicate adherence and greater than zero indicates positive screens for non-adherence. This screen consists of difficulty to pay medicines and problem in getting prescription refill in time. The barrier may be due to forgetfulness, low income status of the family, distant pharmacy or non-availability of medicines in op pharmacy. Distribution of the adherent patients according to access barrier screen was found to be 50\%. The non-adherent study population having screens for access barriers were also found to be 50.2\%.

\textbf{CONCLUSION}

Non-adherence to medication is considered as one of the largest drug related issue. Poor medication adherence can cause negative health outcomes such as worsening of disease, lengthening duration or even death. Chronic diseases that require long term therapy is often associated with non-adherence. Our study was able to find out the medication adherence level in thyroid patients. The study results showed that most of the thyroid patients were non-
adherent to their treatment. This study also revealed that forgetfulness, felt better and stopped, cost of medication and lack of access to drug store/hospital were the major reasons behind non-adherence to medication. Patient counseling regarding the importance of taking medication properly and the issues of non-adherence may be effective to resolve these problems except high cost of medications and lack of access to drug store/hospital which require further strategies. Future studies should include newer strategies to access the adherence level and long term and large population studies.

REFERENCES