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Effectiveness Of Pharmaceutical Care Programme in Geriatric Patients with Hypothyroidism

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Abstract :
Chronic disorders are the major health issues that cause death worldwide. The management of the chronic condition is a major concern in today's scenario. The pharmacist play a lead role in healthcare professional group in the world after physicians and nurses. Pharmacists are the only medical professionals that are mainly for providing medication counseling to patients, despite their extensive training, and as a result, care of public health. Pharmacists might boost integrated primary care delivery across the health system by lowering drug-related adverse events and encouraging greater prescription adherence, which in turn may aid in lowering needless provider visits, hospitalizations, cost-effectiveness and readmissions.
Key words: cost-effectiveness

INTRODUCTION

In India, deaths related to chronic disorders occupy; 15% of global deaths and 60% of total deaths in the country. Majorly, Cardiovascular disorders (CVDs), malignancies, respiratory disorders, and diabetes are contributing to a huge number of deaths and disabilities years in India.[1] The Global Status Report on Noncommunicable Diseases given by the World Health Organization (WHO) states that, unhealthy food habits, sedentary lifestyle, smoking, and binge alcohol consumption are the major risk factors for the high prevalence of chronic disorders and their deaths. According to this report, the major metabolic risk factors are; obesity, increased blood pressure, blood glucose, and cholesterol levels in the body. There was a long pause/declined rate of smoking habits in developed countries, but it was escalatingin India and China. This is also one of the major reasons for the high burden of chronic disorders in our country.

Geriatrics suffering from chronic disorders

The degree to which a patient takes drugs as per physician prescription is called medication adherence (MA). The US center for health transformation given a report on medication adherence highlighting; annually 120,000 people die due to medication non-adherence.
This rate will powerfully influence the growing healthcare system.[2]
Medication non-adherence is one of the most common problems observed in old age persons (geriatrics).The primary reasons for medication non-adherence among geriatric population include;Geriatrics suffers from multiple co-morbid conditionsDue to multiple co-morbid conditions, the risk of polypharmacy will be very highMajority of the geriatrics have anterograde amnesia (loss of memory), this will reduce the property of medication adherence. Sleep disturbance is one of the common symptoms observed in geriatric people. The less sleep of the person makes less alert towards medication intake.
As young people, geriatrics will not be treated in a similar pattern.16 According to the survey made by Medicine and the Elderly in 2005, the risk of medication nonadherence will increase by an increase in the number of medications.
Geriatrics are at high risk for the development of chronic disorders like diabetes, arthritis, hypertension, COPD, and asthma. In chronic disorders, drug therapy lasts for months to years, sometimes lifelong (HIV), this complex the process of medication intake, and leads to medication nonadherence. Evidence suggests that, medication nonadherence will increase hospital re-admission, healthcare cost, morbidity, and mortality.[3]Medication adherence can be improved by the following strategies, which areavailable in the literature;

NEED OF THE STUDY.

Geriatrics are the most vulnerable group for the development of chronic disorders and medication nonadherence is the most common problem in this group of population. So, there is a need to address and resolve medication non-adherence problems in the geriatric population attending the hospital setting.

RESEARCH METHODOLOGY

Study Site:

This project was carried out in Dispensing Pharmacy and General Medicine Department of a Swastik Multispeciality Hospital, Dudu

Study Period: 5 months

Study Design: Prospective Interventional study (Quasi-experimental design without control) carried out in the out-patient general medicine departmentStudy population: All patients who are suffering from chronic disorders, under medication therapy, and attending hospital for routine medical care are the target study population for this project

Study Criteria

Inclusion criteria:

• Patients suffering from primary hypothyroidism and treating with LevoThyroxine for a minimum period of six months

• Patients aged above 55 years and both genders were included.

Exclusion criteria:

• Patients who were undergoing any type of thyroid surgery (Thyroidectomy)

• Patients having a history of neck irradiation

• Patients suffering from secondary hypothyroidism

• Patients who are not willing to participate in the study

• Pregnant women and the pediatric population were excluded from the study.

Sample size calculation:

To determine the number of hypothyroidism patients to be included in the study, a single population proportion formula were used. By the assumption of 50% of the participants having optimal knowledge, 95% confidence interval, 5% of precision, and 80% power, the required sample size was 384. The final required sample size was 403 by considering a 5% non-response rate.

n= Z2 (p) (1-p)/d2

Enrollment of subjects in Hypothyroidism.

A total of 403 patients suffering from hypothyroidism and who met the study criteria was recruited into the study. Baseline demographic profile and KAP assessment and Medication adherence level by VAS and Pill Count method will done in all study subjects. After intervention (Pharmacist mediated counseling) to KAP score and Medication adherence level will be measure.

STUDY METHOD:

KAP Assessment

Knowledge assessment

The patient's knowledge towards hypothyroidism and its management strategies was assessed by using 16 questions (open-ended, closed-ended, and multiple choice) comprising 16 correct answers. Each correct answer scored '1' and the wrong answer'0'. The maximum score expected was '16' and a minimum of zero. The score distribution for each item was represented below

1. Patient aware of the location of the thyroid gland in the body (1 point)

2. Patient able to define what is hypothyroidism (1 point)

3. Patient describes the most common symptoms of hypothyroidism (1 point)

4. Patient can mention the most common causes of hypothyroidism (1 point)

5. Patient can identify the people who are at risk to develop hypothyroidism (1 point)

6. Hypothyroidism is not completely cured (1 point)

7. An idea about the genetic predisposition of hypothyroidism from parents to their children (1 point)

8. The best person to consult for the management of his/her hypothyroidism is an endocrinologist (1 point)

9. Interpretation of thyroid function tests with their hypothyroidism condition (1 point)

10. Foods contraindicated (avoided) in hypothyroidism (1 point)

11. Patient can name the drugs available to treat hypothyroidism (1 point)

12. Patient aware about, the necessity of consultation with an endocrinologist for dose titration in case of pregnancy (1 point)

13. Patient aware of, changing the brand of thyroid tablets is not recommended (1 point)

14. Thyroid tablets need to take lifelong (1 point)

15. Patients are aware of, iron supplements, antacids, and other drugs which are not consumed along with thyroid tablets (1 point)

16. Complications associated with sub-optimal dosage or no treatment of hypothyroidism (1 point)

Attitude assessment

Attitude towards hypothyroidism and its management was assessed by placing 10 mixed statements (positive or negative) on a 3 point Likert scale (Agree 3, Neither agree Nor disagree 2, and Disagree 1). All these statements majorly cover, causes, food restrictions, complications, Levo-thyroxine reatment, adherence towards medications, and herbal medicine therapy. The patients score ranges between 30 and 10. If the patient scores more than or equal to 15 will be anticipated as a positive attitude, and less than 15 will be anticipated as a negative attitude towards hypothyroidism and its management.Practice assessmentThe rational practice was assessed by using 10 questions (closed-ended and multiple choice) that carry 10 correct answers. The score of each patient was expected between '10' and '0'. If the patient cores 8 or more (≥80% correct) will be considered as rational practice, and scores less than 8 (<80% correct) considered as an irrational practice towards hypothyroidism and its management.Measurement of medication adherence Patient adherence to Levo-thyroxine therapy was assessed by Pill-count and VAS methods. These methods are used for measurement of the past one-month medication adherence levels.Pharmacist provided patient counselingPharmacists provided a face to face patient counseling for a period of 5 to 20 minutes, depending upon patient convenience and need. Patient counseling was provided in the local language. During he counseling session, the pharmacist allowed the patient to ask any queries regarding disease and its management strategies. Broadly, the pharmacist conveyed the following counseling parameters during the session.

1. Common symptoms of the hypothyroidism

2. Root causes for the development of hypothyroidism

3. The major risk groups

4. Dietary restrictions (Cabbage, Cauliflower, Radish and other goitrogenic foods)

5. Type of doctor (endocrinologist) needs to be consulted in the management of hypothyroidism

6. Frequency of endocrinologist visit required

7. Frequency of taking thyroid profile

8. Interpretation of thyroid profile with the clinical condition.

9. The importance of medication adherence in achieving definite outcomes (control of symptoms, normal TFT, and prevention of complications)

10. Time and duration of Levo-thyroxine treatment

11. Advice on a skipped dose

12. Tailoring thyroxine therapy in pregnancy

13. Drugs and foods need to be avoided during thyroxine therapy

To prevent forgetfulness of the patient, a Patient Information Leaflet (PIL) will be provided after counseling.

Follow-up

To assess the impact of pharmacist counseling, all patients are advised to come for follow-up visits after a span of three months. In a follow-up visit, medication adherence and KAP scores were measured and compared to baseline scores. The scores obtained for each domain (Knowledge, Attitude, and Practice) were transformed into a percentage. The mean percentage and MA levels were compared between before and after pharmacist mediated counseling.

DATA ANALYSIS

Descriptive statistics (mean, proportion, frequency, and standard deviation) were used to present the socio-demographic profile of the hypothyroidism patientsAnalytical statistics like Chi-square test was used to compare the adequacy of KAP and paired test was used to compare the mean KAP and medication adherence levels pre and post-intervention (Pharmacist mediated counseling)The P-value less than 0.05 was considered as a statistically significant result.

IV. RESULTS AND DISCUSSION

Table 6.1 Socio-demographic profile of study participants in hypothyroidism study(n=403)

Table 6.1 Socio-demographic profile of study participants in hypothyroidism study (n=403)

Characteristic	**Categories**	**Frequency (%)**
Gender	Male	64 (15.9)
	Female	339 (84.1)
Residence	Rural	297 (73.7)
	Semi Urban	64 (15.9)
	Urban	42 (10.4)
Educational status	Illiterate	184 (45.6)
	Primary School	128 (31.7)
	Secondary School	48 (11.9)
	College/University Level	43 (10.6)
Occupation	Farmer	156 (38.7)
	House Wife	167 (41.4)
	Student	49 (12.1)
	Trader	12 (2.9)
	Teacher	5 (1.2)
	Health Care Professional	10 (2.5)

	Others	4 (1.0)
Monthly Household Income (INR)	<10,000 INR	157 (39.0)
	10,000 – 20,000 INR	135 (33.5)
	20,000 - 30,000 INR	56 (13.9)
	30,000 – 40,000 INR	43 (10.6)
	>40,000 INR	12 (2.9)

SD=Standard deviation; INR=Indian rupee

Table 6.1 reveals socio-demographic characteristics of hypothyroidism patients. Majority of the hypothyroidism patients were belongs to female gender (339; 84.1%), rural residency (297; 73.7%), illiterate (184; 45.6%), farmer & house wife (156; 38.7%, 167; 41.4%), and household income less than 10,000 INR (157.0; 39.0)

Table 6.2 Knowledge levels before and after pharmacist mediated patient counseling in hypothyroidism

Variable	**Before Freq. (%) (n=403)**	**After Freq. (%) (n=386)**
Knowledge about the location of thyroid gland location	380 (94.3)	381 (98.7)
Knowledge about hypothyroidism means	220 (54.6)	308(76.4)
Knowledge about common symptoms of hypothyroidism	156 (38.7)	295 (73.2)
Knowledge about common causes of hypothyroidism	168 (41.7)	281(69.72)
Knowledge about the persons who are more likely to get Hypothyroidism	128 (31.7)	325 (80.6)
Knowledge about the curability of the disease	154 (38.2)	381 (94.5)

Knowledge about the familial predisposition of Hypothyroidism	123 (30.5)	325 (84.2)
Knowledge about type of doctor to be consulted for Hypothyroidism	116 (28.8)	347 (86.2)
Knowledge about thyroid function tests and its interpretation in hypothyroidism	82 (20.3)	215 (53.3).
Knowledge about foods need to be avoided in Hypothyroidism	98 (24.3)	228 (56.5)
Knowledge about treatment strategy for hypothyroidism	102 (25.3)	301 (74.6)
Knowledge about the necessity of dose titration in pregnant Women	86 (21.3)	309 (76.6)
Knowledge about the same brand of thyroxine tablets use	105 (26.0)	230 (59.6)
Knowledge about how long thyroid tablets should be taken	132 (32.7)	339 (84.1)
Knowledge about drugs not to be taken along with thyroid Tablets	69 (17.1)	281 (69.7)
Knowledge about complications associated with under or no treatment of hypothyroidism	86 (21.3)	331 (82.1)

Table 6.2 represents the knowledge levels of hypothyroidism patients. Before pharmacist's counseling, less than half of the participants are responded to all knowledge questions. Findings of the knowledge domain reveals that very less proportion of the patients were answered questions related to laboratory interpretation (20.3%), foods need to avoided (24.3%), consultation with endocrinologist (28.8%), treatment strategy (25.3%), dose titration in pregnancy (21.3%), same brand use (26.0%), drugs avoided along with thyroid tablets (17.1%), and complications associated with hypothyroidism (21.3%).

After pharmacist mediated patient counseling, there was a great improvement in the knowledge levels of hypothyroidism patients. More than half of the patients have answered all questions in the knowledge domain.

Table 6.3 Attitude levels before and after pharmacist mediated patient counseling in hypothyroidism

Variable	Before Freq. (%) (n=403)	After Freq. (%) (n=386)
Attitude toward hypothyroidism causes excessive weight gain and obesity	158 (39.2)	367 (91.1)
Attitude toward goitrogens like soya been, cauliflower, and cabbages should be avoided in hypothyroidism	172 (42.7)	291 (72.2)
Attitude toward normal conceive is difficult in thyroid insufficiency	110 (27.3)	352 (87.3)
Attitude toward dose titration is necessary if pregnancy is confirmed	89 (22.1)	370 (91.8)
Attitude toward hypothyroidism will acquire through genetically	192 (47.6)	331 (82.1)
Attitude towards herbal medicines are not helpful in the cure of hypothyroidism	80 (19.8)	281 (69.7)
Attitude towards consultation with endocrinologist will give an appropriate therapy for hypothyroidism	96 (23.8)	301 (74.7)
Attitude towards thyroxine tablets should not be stopped once thyroid laboratory profile comes normal	136 (33.7)	312 (77.4)
Attitude toward medication adherence plays a vital role in controlling symptoms and normalization of thyroid laboratory profile	148 (36.7)	351 (87.1)

Attitude towards self-adjustment of the dose is not recommended in hypothyroidism	184 (45.6)	373 (92.5)

Table 6.3 represents the attitude levels of hypothyroidism patients. Before pharmacists' counseling, very less proportion of the patients were shown a positive attitude towards statements related to dose titration in pregnancy (22.1%), endocrinologist consultation (23.8%), and poor role of herbal medicine (19.8%).

After pharmacist mediated patient counseling, there were high positive attitude levels of hypothyroidism patients. More than half of the patients were shown a positive attitude towards hypothyroidism and its management.

Table 6.4 Practice levels before and after pharmacist mediated patient counseling in hypothyroidism

Variable	Before Freq. (%) (n=403)	After Freq. (%) (n=386)
Practice of consulting thyroid doctor for every three months	106 (26.3)	329 (81.6)
Practice of taking thyroid functions tests for every three Months	98 (24.3)	311 (77.1)
Practice of taking thyroid medications morning time immediately after bed	168 (41.7)	281 (69.7)
Practice of taking thyroid tablets before 60 minutes of food	150 (37.2)	269 (66.7)
Practice of never missing of thyroid tablet intake	82 (20.3)	243 (60.2)
Practice of double dose in the next day morning if the regular dose is missed	42 (10.4)	163 (40.4)

Practice of avoiding intake of calcium, iron, vitamin D, and Antacid tablets along with thyroid tablets	84 (20.8)	295 (73.2)
Following rational practice when switching on to alternative Medicine	22 (5.4)	64 (16.6)
Practice of avoiding goitrogenic foods	106 (26.3)	281 (69.7)
Persons strongly agreed that thyroid tablets help in the controlof hypothyroidism and its symptoms	128 (31.7)	369 (91.5)

Table 6.4 represents the practice levels of hypothyroidism patients. Very less proportion of the patients are having the right practices towards hypothyroidism management. After pharmacists mediated patient counseling, the majority of the patient practices were improved.

Table 6.5: Comparison of Adequacy of Knowledge, Attitude, Practices, and Medication Adherence of patients before and after Counseling in hypothyroidism

Variable	Before Freq. (%) (n=403)	After Freq. (%) (n=386)	χ^2-value	*P-value*
Knowledge			93.23	
Good Knowledge	94 (23.3)	326 (84.4)		<0.0001
Moderate Knowledge	141 (34.9)	39 (10.1)		
Poor Knowledge	168 (41.7)	21 (5.4)		

Attitude Positive Attitude Negative Attitude	178 (44.1) 225 (55.8)	372 (96.4) 14 (3.6)	46.20	<0.0001
Practice Good Practice Poor Practice	134 (33.2) 269 (66.7)	375 (97.1) 11 (2.8)	78.14	<0.0001

Table 6.5 illustrates the adequacy of knowledge, attitude, and practices of hypothyroidism patients before and after pharmacist mediated patient counseling. The findings show that, a significant improvement (<0.0001) in good knowledge (84.4%), positive attitude (96.4%), and good practice (97.1%) after counseling.

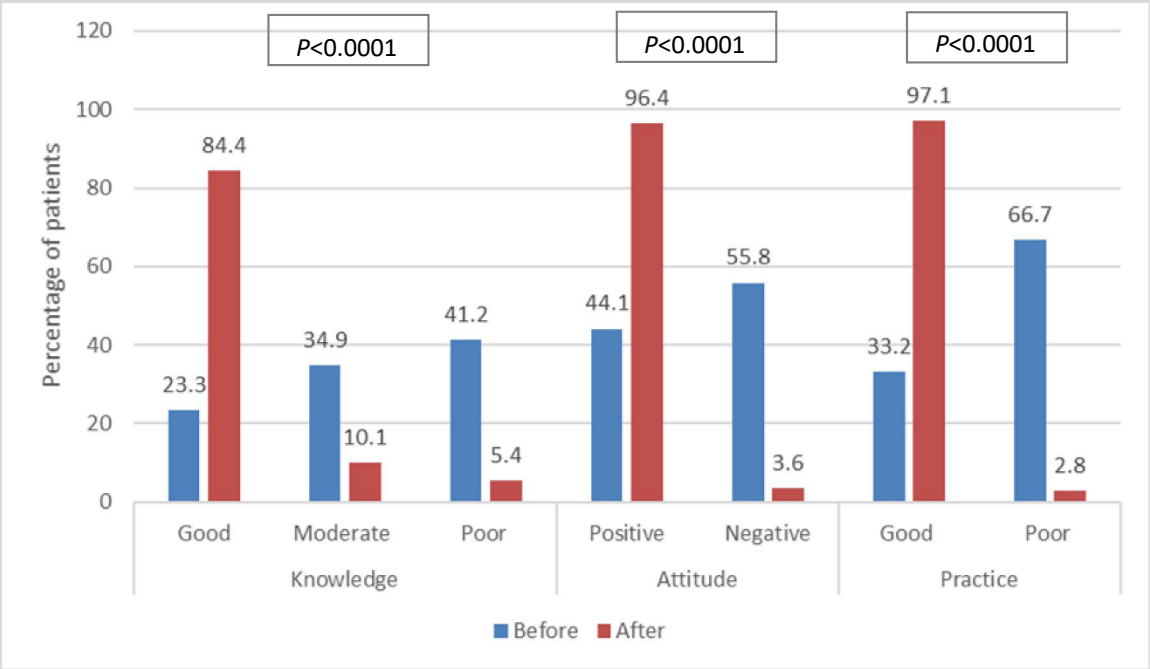

Figure 6.1 Comparison of the adequacy of KAP of patients before and after counseling in hypothyroidism

Figure 6.1 illustrates the adequacy of knowledge, attitude, and practices of hypothyroidism patients before and after pharmacist mediated patient counseling. The majority of the patients were having poor knowledge (41.2%), negative attitude (55.8%), and poor practice (66.7%) before counseling. The findings of the study show that, a significant improvement (<0.0001) in the good knowledge (84.4%), positive attitude (96.4%), and good practice (97.1%) after counseling.

Table 6.6 Comparison of mean KAP before and after patient counseling in hypothyroidism

Variable	Before (n=403) Mean ±SD	After (n=386) Mean ±SD	*P*-value
Knowledge	34.1±21.7	80.5±16.4	<0.0001
Attitude	33.8±22.9	86.2±15.7	<0.0001
Practice	24.5±20.9	67.5±13.8	<0.0001

Table 6.6 represents the mean knowledge, attitude, and practice levels of hypothyroidism patients towards management and control of hypothyroidism. The findings reveal that there was significant (<0.0001) improvement in the mean KAP after pharmacist mediated patient counseling.

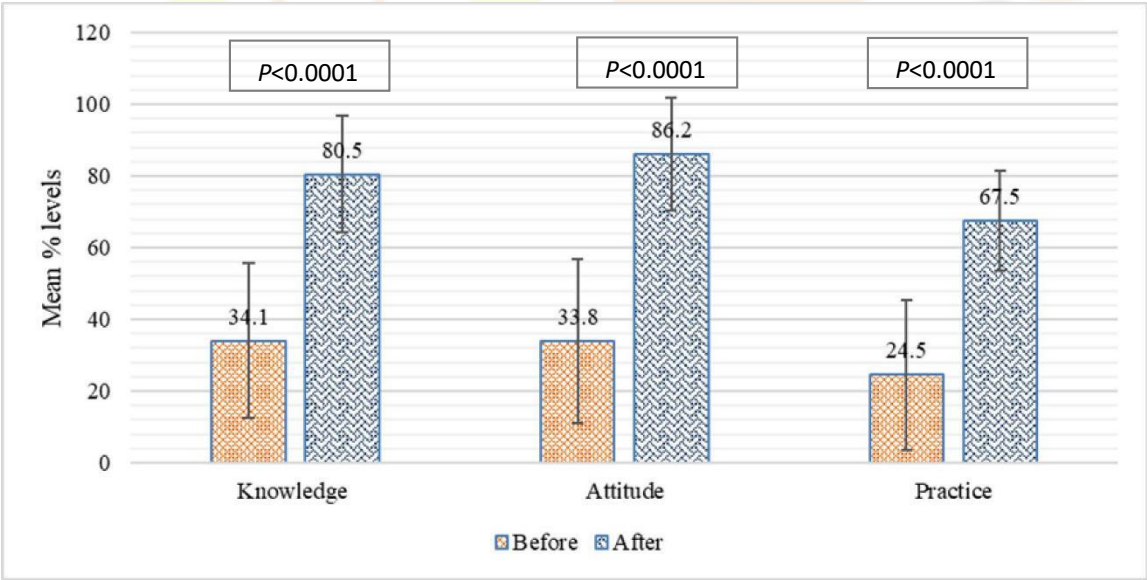

Figure 6.2 Comparison of mean KAP between before and after patient counseling in hypothyroidism

Figure 6.2 illustrates the mean knowledge, attitude, and practice levels of hypothyroidism patients towards the management and control of hypothyroidism. The findings reveal that there was significant (<0.0001) improvement in the mean knowledge (80.5±16.4), attitude (86.2±15.7), and practice (67.5±13.8) levels after pharmacist mediated patient counseling.

Table 6.7 Comparison of medication adherence between before and after patient counseling in hypothyroidism

Method	Before (Mean ± SD)	After (Mean ± SD)	Difference (Mean ± SD)	*P*-value
Pill-count	80.3 ± 6.4	97.4 ± 3.26	12.1 ± 6.4	<0.0001
VAS	76.8 ± 6.8	92.4 ± 4.8	10.3 ± 5.8	<0.0001

VAS=Visual Analogue Scale; SD=Standard Deviation

Table 6.7 represents the medication adherence levels measured by pill-count and VAS method before and after patient counseling. Medication adherence findings reveal that, there was a significant (P <0.0001) improvement in medication adherence levels after (97.4±3.26; 92.4±4.8) providing patient counseling in both methods.

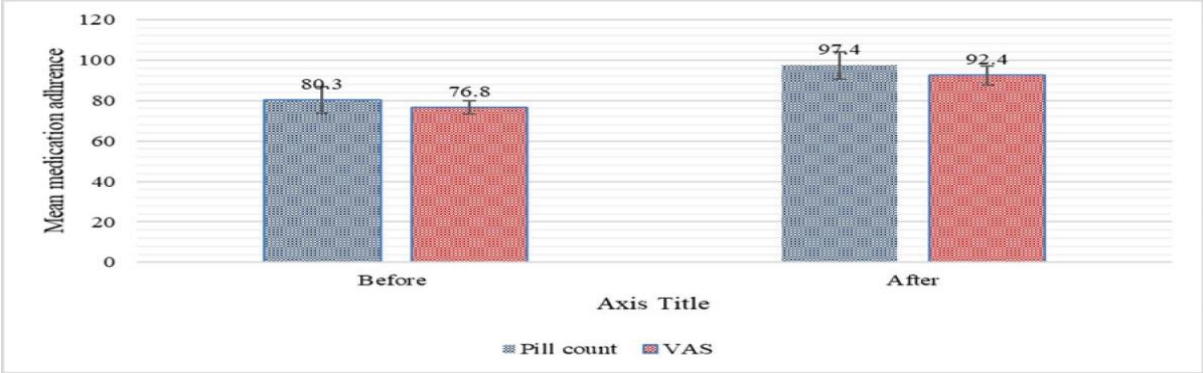

Figure 6.3 Comparison of medication adherence between before after counseling in hypothyroidism

Figure 6.3 illustrates the medication adherence levels measured by pill-count and VAS method before and after patient counseling. Medication adherence findings reveal that, there was a significant (P <0.0001) improvement in medication adherence levels after (97.4±3.26; 92.4±4.8) providing patient counseling in both methods.

Table 6.8 Association of socio-demographic characteristics with good knowledge, positive attitude, and rational practice towards hypothyroidism

Characteristic	**Total N=403**	**Good knowledge (94)**	**χ2 (*P* value)**	**Positive attitude (178)**	**χ2 (*P* value)**	**Rational practice (134)**	**χ2 (*P* value)**
Gender							
Male	64	10 (15.6)	2.5	31 (48.4)	0.56	20 (31.2)	0.14

Female	339	84 (24.7)	(0.11)	147 (43.4)	(0.4)	114 (33.6)	(0.7)
Residence							
Rural	297	34 (11.4)	122	97 (32.6)	66.2	74 (24.9)	47.4
Semi Urban	64	24 (37.5)	(<0.001)	43 (67.2)	(<0.001	28 (43.7)	(<0.001)
Urban	42	36 (85.7)		38 (90.5)	)	32 (76.2)	
Educational Status							
Illiterate	184	38 (20.6)		62 (33.7)		26 (14.1)	
Primary	128	23 (17.9)	21.4	54 (42.2)	33.5	40 (31.2)	104
Secondary	48	11 (22.9)	(<0.001)	28 (58.3)	(<0.001	32 (66.6)	(<0.001)
College	43	22 (51.1)		34 (79.1)	)	36 (83.7)	
Healthcare job							
Yes	10	8 (80.0)	18.4	9 (90.0)	8.7	7 (70.0)	6.2
No	393	86 (21.8)	(<0.001)	169 (43.0)	(0.003)	127 (32.3)	(0.012)

Table 6.8 illustrates association of various socio-demographic characteristics of the study participants with adequacy of KAP towards hypothyroidism. Variables like age less than 40 years, urban residency, college or university level education, and healthcare job were strongly associated with good knowledge, positive attitude, and rational practice. The study shows, both males and females are nearly same in the proportion of having good knowledge, positive attitude, and rational practice.

Table 6.9 Patient satisfaction towards pharmacist provided counseling services in hypothyroidism (n=220)

Variable	Very Unsatisfied No. (%)	Unsatisfied No. (%)	Neither Satisfied Nor Unsatisfied No. (%)	Satisfied No. (%)	Very Satisfied No. (%)
1. Pharmacist introduction before counseling session	1 (0.4)	1 (0.4)	2 (0.9)	182 (82.7)	34 (15.4)
2. Information provided about disease	1 (0.4)	2 (0.9)	12(5.4)	156 (70.9)	49 (22.3)
3. Voice and tone of counsellor	0 (0.0)	1 (0.4)	1 (0.4)	203 (92.3)	15 (6.8)
4. Information regarding drug regimen	2 (0.9)	4 (1.8)	12 (5.4)	163 (74.1)	39 (17.7)
5. Doubts clarification	8 (3.6)	11 (5.0)	38 (17.3)	100 (45.4)	63 (28.6)
6. Counseling language	3 (1.4)	2 (0.9)	3 (1.4)	126 (57.3)	86 (39.1)
7. Use of counseling Aids	4 (1.8)	8 (3.6)	23 (10.4)	129 (58.6)	56 (25.4)
8. Time spent for counselling	2 (0.9)	2 (0.9)	2 (0.9)	198 (90.0)	16 (7.3)
9. Ending counseling session	10 (4.5)	9 (4.1)	42 (19.1)	83 (37.7)	76 (34.5)

10. Overall satisfaction	5 (2.3)	7 (3.2)	64 (29.1)	79 (35.9)	65 (29.5)

Table 6.9 presents patient satisfaction towards pharmacist provided counseling services in hypothyroidism. Among 386 participants, 220 are given feedback regarding provided counseling services. Majority of the participants given positive feedback and favoring the requirement of pharmacist delivered counseling services. Very few of the participants are dissatisfied with counseling services due to their time constraint

Table 6.10 Adequacy of patient satisfaction towards pharmacist provided counseling services among hypothyroidism patients (n=220)

Satisfactory level	**Frequency (%)**
Satisfied	194 (88.2)
Dissatisfied	26 (11.8)

Likert scale responses of the participants were divided into two categories (Satisfied and Dissatisfied) based on score more than or equal to 25 and <25. Diabetic study findings reveal that 88.2% of patients are satisfied and recognized pharmacist mediated counseling services.

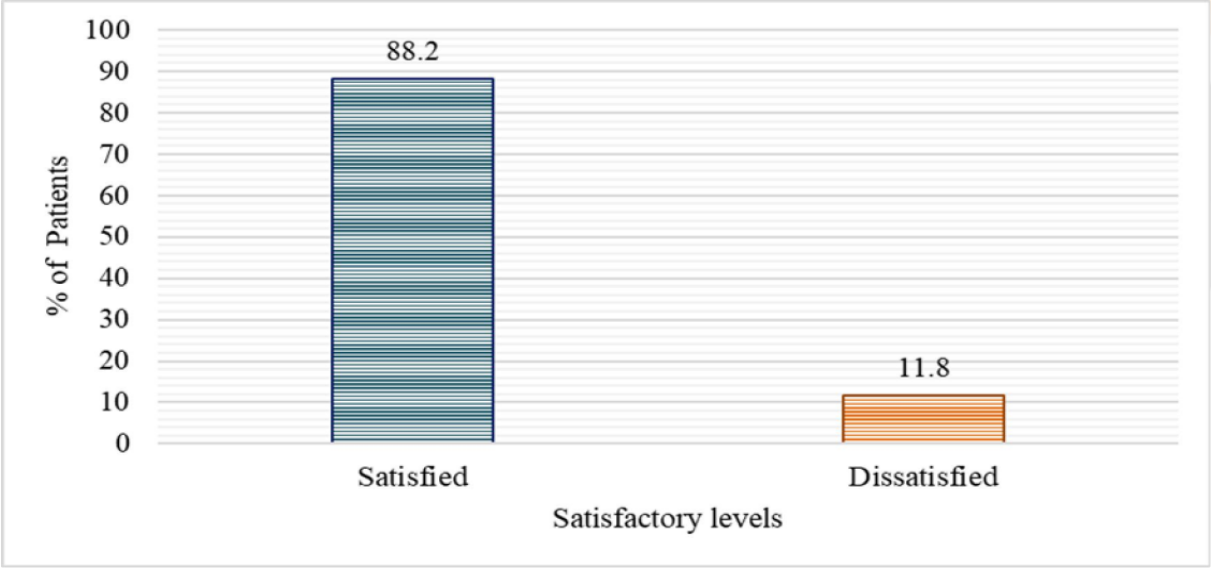

Figure 6.4 Patient satisfaction towards counseling services provided in Hypothyroidism

Figure 6.4 illustrates satisfaction towards counseling services provided in hypothyroidism. The majority (88.2%) of the study participants were satisfied with the provided counseling services.

7. DISCUSSION

Hypothyroidism disorder strongly associated to develop metabolic disturbances like obesity, diabetes, cardiovascular disorders, and metabolic syndrome, obstetric and gynecological complications. Good knowledge, positive attitude, and rational practices of hypothyroidism patients will definitely improve long term outcomes. Studies focusing on assessment of KAP towards hypothyroidism in India are very less.[30,31] In these, most of the studies are related to the assessment of the KAP towards hypothyroidism, but no study made an effort to deliver any educational intervention to advance the KAP levels among hypothyroidism patients. This is the prime study which was intended to explore the impact of pharmacist delivered counseling on KAP and medication adherence levels in hypothyroidism patients. The study was performed in the rural settings of south India, where people deprived of financial status, formal education, and primary health care.[32] So, the pharmacist planned counseling sessions will have a positive impact on KAP and medication adherence levels in hypothyroidism management. These study findings are nearly similar to a case-control study conducted in Nepal and the mean age of patients was 42±13.4 years.[33] Before pharmacists' counseling, less than half of the participants are responded to all knowledge questions.[34]

Findings of the knowledge domain reveals that, very less proportion of the patients were answered questions related to laboratory interpretation (20.3%), foods need to avoided (24.3%), consultation with endocrinologist (28.8%), treatment strategy (25.3%), dose titration in pregnancy (21.3%), same brand use (26.0%), drugs avoided along with thyroid tablets (17.1%), and complications associated with hypothyroidism (21.3%).[35] These findings are almost similar to a crosssectional study conducted in Delhi (Kumar et al., 2017).[36]In our study, the poor knowledge levels at baseline are majorly due to the majority of the respondents were illiterate (73.7%) and rural background (45.6%). The knowledge scores of the study participants were very low compared to the knowledge scores of the multi-centric study conducted in India (Sethi et al., 2018). The major reason for the presence of the knowledge gap between these studies was due to enrollment of only literate patients in their study (Sethi et al., 2018); whereas our study findings, explores the baseline knowledge levels of patients irrespective of their literacy, residing in rural settings in India.[37]

After pharmacist mediated patient counseling, there was a great improvement (P< 0.0001) in the knowledge levels of hypothyroidism patients. More than half of the patients have answered all questions in the knowledge domain.[38]

The study findings reveal that, less than half of the respondents had the right attitude towards hypothyroidism and its management. After the pharmacist delivered counseling session there was a significant (P<0.0001) improvement in positive attitudes towards various aspects like a consultation with endocrinologist requires to get a better patient care, self-dose adjustment was not advised, taking thyroid tablets should never stop without consulting endocrinologist, and dose titration is required if pregnancy is confirmed. A similar type of elevated positive attitudes levels is also observed in the pharmacist intervention study conducted among hypothyroidism patients attending the endocrine clinic of Nepal.[39]

Medication adherence findings reveal that, there was a significant (P<0.0001) improvement in medication adherence levels after (97.4±3.26; 92.4±4.8) providing patient counseling in both methods. This suggests counseling about the importance of medication intake, and complications associated with nonadherence will have a greater impact over adherence levels in hypothyroidism patients.

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