A Cross-Sectional Analysis of Thyroid Carcinoma in Adults: Clinical Insights from Malaysia

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ABSTRACT

The unique demographic composition and regional variations play a crucial role in shaping the epidemiology of thyroid cancer in Malaysia. This research study delves into the prevalence of thyroid carcinoma and clinical awareness among adults in the country, while also exploring the relationship between these factors. Using a cross-sectional survey approach, the study enables simultaneous examination of various variables. Data was collected from 191 adults aged 19 to 60 diagnosed with thyroid carcinoma, and analyzed using statistical software like SPSS. Various statistical tests such as frequency analysis, normality test, Mann-Whitney U test, Kruskal-Wallis test, and Spearman's rank correlation were utilized to scrutinize the gathered data. The results of the study reveal disparities in cancer rates, co-morbidities, knowledge of treatment options, awareness of different types of cancer, and ability to recognize symptoms among participants. These findings highlight the diverse health backgrounds of individuals and underscore the need for further research to validate these results, stressing the importance of targeted educational and awareness campaigns. The implications of this research are valuable for healthcare organizations in formulating policies and educational initiatives aimed at improving outcomes for individuals with thyroid cancer. Overall, this study contributes to a better understanding of thyroid cancer trends in Malaysia and underscores the importance of targeted awareness campaigns for early detection and effective treatment strategies.

1. Introduction

1.1 Background of the Study

Thyroid cancer has emerged as a significant worldwide health issue, with its increasing frequency in recent years. (J. Huang et al., 2023; Kim, Gosnell, & Roman, 2020). This pattern is particularly notable in Malaysia, where the rising number of cases of thyroid cancer in adults has led to a comprehensive investigation into its clinical significance (Kim et al., 2020). It is important to understand the overall occurrence of thyroid cancer in medical settings and public awareness is significant due to its various types and demographic influences (Miranda-Filho et al., 2021; Pizzato et al., 2022). Papillary Thyroid Carcinoma (PTC) is the most common type of thyroid cancer worldwide, among various other forms of thyroid carcinoma (Baloch et al., 2022; Crnčić, Tomaš, Girotto, & Ivanković, 2020). Different types such as anaplastic, medullary and follicular carcinomas exhibit diverse clinical characteristics and prognostic outcomes (Alhozali, 2023; Razavi et al., 2024). The cause of thyroid cancer is complex, involving a combination of dietary factors, environmental influences and genetic predispositions (Aruoma et al., 2019; Kruger et al., 2022). In particular, the lack of iodine is

known to be a significant factor (Farebrother, Zimmermann, & Andersson, 2019; Zhang, Zhang, Li, Feng, & Teng, 2022).

In Malaysia, the unique combination of population demographics and geographical differences impacts the spread of thyroid cancer (Zuhdi, Rahman, Damitri, Ismail, & Hassan, 2021). The National Cancer Registry states that thyroid carcinoma is among the top cancers affecting females in Malaysia, with a notable increase in instances in the past few years (Liew, Ahmad, Basro, Baghawi, & Abdullah, 2021). Thyroid cancer often manifests as a solitary thyroid nodule or an enlarged gland, but is frequently found incidentally during imaging tests for distinct conditions (Hu, Wu, & Jiang, 2024; Walker, Karthik, Chengot, & Vaidyanathan, 2022). The signs and symptoms can vary significantly depending on the particular form of cancer and the timing of its diagnosis. Fine Needle Aspiration Cytology (FNAC) is a significant diagnostic instrument for assessing thyroid nodules, though, its sensitivity may vary depending on the histological subtype (Al Munajjim et al., 2022).

It is essential to have a good understanding of thyroid cancer in order to identify and treat it in its early stages (Rahman et al., 2019). Thyroid cancer rates are increasing in Malaysia, yet there is a lack of public awareness about the disease. Research shows that many people are unable to recognise the symptoms of thyroid cancer, resulting in late diagnosis and limited treatment options (Alshehri et al., 2023). Implementing educational schemes for both healthcare workers and the general population is essential to increase awareness (Alotaibi et al., 2019; Karasiewicz, Chawłowska, Lipiak, & Więckowska, 2022). Efforts like these aim to teach individuals about potential risks, early symptoms of illness, and the significance of routine health examinations for individuals with elevated risk (Jensen, Saucke, Francis, Voils, & Pitt, 2020). Recognizing the link between clinical occurrence and public knowledge is crucial for creating successful health strategies (Drozd, Branovan, & Reiners, 2020). Limited understanding is strongly linked to the high rates of occurrence, suggesting that implementing more educational efforts could greatly improve the rates of early detection (Czubek, Alcer, Varjacic, & Romaniuk, 2022; Kim et al., 2020). On the other hand, a greater understanding could result in individuals at risk of thyroid cancer being more proactive in seeking medical help.

1.2 Problem Statement

Thyroid carcinoma is increasingly common in Malaysia when compared to other types of cancer (Lazim & Ismail, 2023). Recent data indicates that thyroid cancer ranks as the fourth most prevalent form of cancer in the country, showing a noticeable increase in incidence over the past decade. Despite this growing trend, there remains a significant lack of clinical understanding regarding thyroid cancer in the adult population in Malaysia. Many individuals possess limited knowledge concerning the symptoms, causes, and importance of early detection of the disease, which can greatly impact the effectiveness of treatment. The deficiency in knowledge is compounded by a healthcare environment where thyroid disorders are frequently misdiagnosed or diagnosed late. This is particularly concerning because early-stage thyroid cancer, such as papillary thyroid cancer (PTC), generally carries a favourable prognosis with proper treatment. However, delays in diagnosis could result in more complex treatment regimens and reduced chances of survival. Furthermore, it is crucial to obtain comprehensive data on the prevalence of thyroid cancer in various demographic groups in Malaysia. Consequently, this research aims to address these gaps by conducting a cross-sectional analysis of thyroid cancer in the adult population of Malaysia.

1.3 Significance of the Study

The importance of this research lies in its potential to provide valuable insights into the comprehension and management of thyroid cancer in Malaysia. This study has the ability to

impact healthcare strategies and resource allocation for cancer treatment by shedding light on the prevalence of thyroid cancer in clinical settings. It is essential to evaluate the clinical knowledge of adults in order to develop tailored educational approaches that can improve early detection and treatment results. Recognizing the relationship between clinical occurrences and awareness lays the groundwork for future public health initiatives aimed at decreasing the morbidity associated with thyroid cancer. Ultimately, the goal of this study is to enhance medical practices and outcomes for patients in Malaysia by increasing awareness of thyroid health issues. Additionally, the current study aims to address significant gaps in understanding thyroid cancer among adults in Malaysia by examining its clinical occurrence and awareness levels. The information gained from this research will be vital in shaping future healthcare policies and educational programs targeted at enhancing early detection and treatment results. Ultimately, the objective is to improve patient care and decrease the occurrence of thyroid cancer in Malaysia through a focus on clinical proficiency and public awareness.

1.4 Research Questions

The research questions of the current study is listed as follows,

- What is the current clinical prevalence rate of thyroid carcinoma across adults in Malaysia?
- What is the awareness level about thyroid cancer among adults in Malaysia?
- How does clinical prevalence of thyroid carcinoma and clinical awareness on thyroid cancer related together?

1.5 Objectives of the Study

The main objective of the study is to determine the clinical insights into thyroid carcinoma among adults in Malaysia. The key objectives are described as follows,

- To identify the clinical prevalence of thyroid carcinoma among adults in Malaysia.
- To assess on the clinical awareness on thyroid cancer among Adults in Malaysia.
- To determine the relationship between clinical prevalence of thyroid carcinoma and clinical awareness on thyroid cancer.

1.6 Paper Organizations

The current study is structured in a following organized manner. An overview of thyroid carcinoma were described in the introduction section. Section 1 also elucidates the problem statement, significance, and research objectives of the study. Section 2 will review existing studies along with its pitfalls. Section 3 will reveal the methodology utilized for data collection and analysis of the current research. Furthermore, in Section 4, the achieved outcome will be represented with its relevant interpretation. The discussion and comparison of results of the current study and existing studies will be deliberated in section 5. The limitation and conclusion of the present research along with its future scope will be addressed in Sections 6 and 7, respectively.

2. Literature Review

A study carried out in Malaysia by (Khor, Suppiah, Wong, & AH, 2021) investigated children with differentiated thyroid cancer (DTC) who underwent radioactive iodine (RAI) therapy at Hospital Kuala Lumpur (HKL) and were monitored from 2000 to 2016 in a retrospective, longitudinal research. The study group consisted of 65 patients, with an average monitoring duration of 58.8±36 months. The detailed clinical and pathological information of the patients was meticulously recorded and then analyzed in a descriptive manner. Statistical tests like the chi-square and Kruskal-Wallis were utilized to assess the relationship between categorical and continuous variables with disease status, with a p-value of <0.05 considered statistically significant. Among the pediatric DTC patients analyzed, the majority were girls, accounting for 78.5% of the group. Notably, 89.2% of the individuals fell within the adolescent age group.

Characteristics such as being pre-pubertal, having cervical nodal involvement, extra-thyroidal extension, and lymphovascular invasion all had a notable connection to the existence of distant metastases at the time of diagnosis. Fortunately, no fatalities were documented during the entire duration of the follow-up. In the complete group of patients, 60% achieved remission, while the remaining 40% were classified as having ongoing illness. Notably, the long-term existence of the illness was associated with the presence of distant metastases upon initial presentation (p=0.025).

(Ma, Ma, Hou, & Fu, 2022) highlighted the importance of raising awareness among Malaysians about the connection between obesity and thyroid cancer. (Matrone, Ferrari, Santini, & Elisei, 2020) agreed with (Ma et al., 2022) on the connection between the increasing rates of obesity and the surge in cases of differentiated thyroid cancer according to recent data. Between 1995 and 2015, the significant rise in instances of parathyroid cancer is believed to have been mostly influenced by overweight and obesity. In 2015, it was estimated that approximately 1 out of every 6 instances of parathyroid cancer in people aged 60 and above, accounting for nearly two-thirds of cases of significant parathyroid cancers, were associated with excess weight or obesity. The study made use of data from the National Institutes of Health-American Association of Retired Persons Diet and Health study (Disorders, 2024). A team of researchers studied 457,331 people aged 50 to 71 who were cancer-free at the beginning of the research (Kitahara, Pfeiffer, Sosa, & Shiels, 2020). Revised hazard ratios were re-evaluated after accounting for various factors in order to examine the correlation between varying body mass index groups and the probability of developing parathyroid cancer. Additionally, the study involved computing population attributable fractions by utilizing estimated hazard ratios and annual prevalence estimates of overweight and obesity obtained from the National Health Interview Survey. These population attributable fractions, in combination with data from the Surveillance, Epidemiology, and End Results-13 database, were utilized to ascertain the annual percentage increases in parathyroid cancer incidences attributed to excess weight and obesity.

(X. Huang et al., 2024) It was reported that both being overweight and obese were considered notable individual risk factors for the severity of papillary thyroid cancer, particularly in men. A study was conducted on 1720 individuals with parathyroid cancer who underwent total thyroidectomy or lobectomy between January 2017 and April 2020. The individuals were separated into two categories depending on their body mass index: CON group (< 24 kg/m^2) and OB group (≥ 24 kg/m^2), with assessments carried out individually for both genders. The results indicated that both overweight and obese were significant individual risk factors for the aggressive behavior of parathyroid cancer in male patients. Consequently, these results emphasize the importance of tailoring treatment plans based on BMI risk classification, particularly for men.

The presence of thyroid growths in medical situations can be categorized into two primary groups: benign and malignant (Disorders, 2024). Non-cancerous thyroid growths, such as adenomas, are benign tumours that typically do not spread to other parts of the body. While usually not life-threatening, benign tumours in the neck can sometimes grow large enough to cause discomfort or press on nearby tissues. Managing benign thyroid nodules can involve keeping track of them, using hormone therapy to manage growth, or opting for surgery if symptoms are severe. Malignant thyroid tumours signal thyroid cancer, a serious condition that can spread if not treated promptly. Various types of thyroid cancer are present, with papillary thyroid carcinoma being the most common, accounting for approximately 80% of all instances (Zamora-Ros et al., 2019). Other forms of thyroid cancer include follicular, medullary, and anaplastic variations. Rates of thyroid cancer have been on the rise globally, with Malaysia being no exception. Thyroid cancer ranks as the eighth most prevalent cancer in Malaysia among women, with approximately 3.8 cases per 100,000 women. Early detection and early

treatment are crucial for improving outcomes, especially since numerous types of thyroid cancer have a good prognosis when caught early.

(Apostolou et al., 2021) highlighted that diagnosing thyroid cancer usually requires a mix of clinical assessment, imaging tests, and biopsy. A physical examination in a clinical setting can identify a lump or nodule in the neck, prompting further assessment with imaging techniques such as ultrasound, which provides detailed images of the thyroid gland. Fine needle aspiration (FNA) biopsy is a routine procedure used to gather a nodule sample for cytological examination, assisting in distinguishing between benign and malignant cells (Nabhan, Dedhia, & Ringel, 2021). The treatment of thyroid cancer depends on its type, stage, and the extent of the disease. The main treatment for most thyroid cancers is typically surgical, involving the removal of part or all of the thyroid gland (thyroidectomy). In case the cancer has spread to neighbouring lymph nodes, a neck dissection might also be performed. Radiation therapy using iodine is commonly used after surgery to remove any remaining cancer cells and prevent recurrence (Khor et al., 2021). More aggressive forms of thyroid cancer, such as anaplastic carcinoma, may require additional treatments like external beam radiation therapy, chemotherapy, and targeted therapies. Another use of hormone therapy involves providing additional thyroid hormone to individuals who have undergone complete thyroid removal to support normal metabolic function.

2.1 Research Gap

Even though, the prevailing studies have examined the prevalence of thyroid carcinoma and the awareness among individuals, there exist a significant pitfalls, which are described as follows,

- For instance, few studies (Kitahara et al., 2020) and (X. Huang et al., 2024) have ignored the diverse and geographic landscape of Malaysia.
- Few studies (Apostolou et al., 2021) and (Nabhan et al., 2021) have disregarded to investigate the thyroid carcinoma across specific demographic like adults.
- The study (Matrone et al., 2020) has omitted to investigate the relationship among clinical awareness and clinical prevalence of thyroid carcinoma.

Therefore, there exist a scope to extend the research in these aspects, as these features can support health organizations to diagnose and treat thyroid carcinoma earlier. Thus, the current study explores the clinical prevalence and awareness about thyroid carcinoma among adults in Malaysia, further the relationship among these variables.

3. Research Methodology

3.1 Research Design

The proposed study adopts cross-sectional survey research design that is regarded as relevant for investigating the clinical prevalence of Thyroid Carcinoma across adults in Malaysia. This research technique permits data collection at a single point in time, which gather information from a diverse range of without needing to implement extensive follow-up procedures. This approach permits to examine multiple variables simultaneously. Furthermore, the cross-sectional approach permits data collection in an effective and economical manner. The usage of cross-sectional study offers an understanding about awareness and prevalence of thyroid cancer across adults in Malaysia. In addition, the cross-sectional survey allows for investigating association between variables. Thus, the relationship among demographic factors, knowledge levels, beliefs about thyroid cancer, and the frequency of the disease can be explored. This assessment aids in detecting potential risk factors and areas that require targeted innovations.

The research design plans a two-phase study to gain clinical comprehension into thyroid cancer among adults in Malaysia. The pilot study of Phase 1 will evaluate the feasibility of the survey tool and offer initial results, while Phase 2 will magnify the study to a huger sample for

thorough analysis and conclusive outcomes. Ethical concerns and comprehensive data analysis methods are utilized in both phases to ensure the validity and reliability of the study results.

3.2 Study Area

The research regards Klang Valley also regarded as Greater Kuala Lumpur in Malaysia as the study area for the purpose of the research. The Klang Valley comprises of various districts and municipalities such as Kuala Lumpur, Petaling, Klang, Hulu Langat, Gombak, Sepang and Kuala Langat. The research has regarded people from these area to congregate data, which will augment the significance of research objectives.

3.3 Sampling Techniques

The study considers adults in the Klang Valley in Malaysia as the total population. A total of 200 thryoid cancer individuals are selected as study samples. The study utilizes convenience sampling technique, it chooses respondents who are easily available and accessible within the Klang Valley districts.

3.4 Research Instruments

The latest study involves gathering data from adults diagnosed with thyroid cancer through structured surveys. Initially, a questionnaire in the survey aids in maintaining consistent data collection, and consistency is crucial for analysing responses from different adults in the Klang Valley of Malaysia. The questionnaire is a versatile tool that can collect various data on different aspects related to thyroid cancer. This investigation will include questions about age, gender, ethnicity, personal history with thyroid cancer, knowledge of risk factors and symptoms, awareness of screening options, attitudes towards the disease, and behaviours related to thyroid health issues. This comprehensive approach allows researchers to fully comprehend the factors influencing the occurrence and detection of thyroid cancer.

Moreover, using a survey questionnaire ensures confidentiality and privacy, which encourages participants to provide genuine and honest responses. This is especially important when collecting information on sensitive health behaviours and beliefs. In an anonymous survey, participants can share their experiences and perspectives more freely, resulting in more precise and detailed data. Also, this approach reduces potential biases in the data collection process, confirming the credibility and accuracy of the data. The survey questionnaire comprises 24 items rated on a 4-point Likert scale to measure respondents' agreement or disagreement with each statement. Integrating demographic details and clinical findings from surveys will provide a comprehensive evaluation of the frequency, causes, and understanding of thyroid cancer among Malaysian adults, particularly in the Klang Valley region.

3.5 Data Collection

Data has been gathered by approaching potential participants in various locations across the Klang Valley, including healthcare facilities, community centres, and shopping malls. The data was obtained from adults aged between 19 and 60 in the Klang Valley, Malaysia. This research focuses on individuals diagnosed with stage 2 and 3 thyroid cancer. The initial phase of the study is expected to span approximately 2 years for the collection of data, with the aim of ensuring a swift and effective process. The data is gathered from volunteers, thereby ensuring the trustworthiness and precision of the research findings.

Before the commencement of data collection, a pilot test of the survey questionnaire was carried out with a small group of individuals. The results from the pilot study were validated, revealing a Cronbach's alpha of 0.85, which illustrates the high internal consistency and dependability of the questionnaire. Subsequently, ethical approval is obtained from the Institutional Review Board or the relevant ethics committee to protect the confidentiality of

participants, implement informed consent procedures, and uphold participant rights. Measures are enacted to ensure the accuracy and integrity of the data through comprehensive assessments for quality assurance. Data was collected from a total of 200 individuals with thyroid cancer.

3.6 Data Analysis

It entails a comprehensive and systematic review of numerical data as part of the data analysis process. This is done to obtain valuable insights and produce robust results. In this study, frequency and percentage analysis were utilised to investigate various aspects of thyroid cancer, such as participant demographics, distribution of clinical knowledge, and prevalence in clinical settings. The analysis of frequency and percentage is employed to identify patterns, trends, and inconsistencies within the data. This data is crucial for gaining insight, identifying problem areas, and directing future efforts or educational campaigns aimed at enhancing awareness and prevention of thyroid cancer. Various factors are taken into account when determining whether to use parametric or non-parametric tests for data analysis in the study. The selection of test types is based on the data distribution and assumptions of each specific test.

Firstly, the normality of the data distribution is assessed. If the data meets the criteria of normal distribution and equal variance, parametric tests are used. These include Independent samples t-test, ANOVA, and Pearson correlation. In cases where the data does not adhere to the assumptions of normality or variance equality, non-parametric tests are applied. The Mann-Whitney U test, Kruskal-Wallis test, and Spearman's rank correlation are examples of tests that can handle deviations from these assumptions. Utilizing these methods ensures a strong analysis and dependable results, even when dealing with data that does not meet the necessary requirements for parametric tests. The selection of data analysis techniques was based on the characteristics of the data and the research goals of the study. By carefully selecting the appropriate statistical methods, the study is able to accurately evaluate the clinical understanding and incidence of thyroid cancer, providing valuable information for public health initiatives and future investigations.

3.7 Ethical Consideration

The proposed study followed and considered certain norms and ethics. Initially, the ethical approval was received from Lincoln University College. Applications were made online through the National Malaysian Research Registry, comprising a designated reference number and date of issue. Since, it is a survey research, ethical principles and research protocols were thoroughly regarded. The ethical approval letter has been acquired from K CLINIC located in Malaysia for data gathering from the patients. Each person must ensure the privacy of their own data. The data are congregated after receiving informed consents from the respective respondents who were taken part in the survey. Moreover, the ethical consideration process verifies the validity and reliability in data collection and outcomes of the study.

4 Results

4.1 Demographic Analysis

The proposed study regards the total of 200 adults with thyroid carcinoma in between the age of 19 and 60 years old.

Table 4.1 Demographic Characteristics of Respondents

Factor	Parameter	Frequency	Percentage (%)
Age	20-29	40	20
	30-39	60	30
	40-49	70	35
	50-59	30	15
Gender	Male	80	40
	Female	120	60

Diagnosis: Thyroid Carcinoma Stage Of Cancer	Stage 1	70	35
	Stage 2	35	17
	Stage 3	55	28
	Stage 4	40	20
Race / Ethnicity	Malay	130	65
	Chinese	40	20
	Indian	30	15
Monthly Income	< RM3000	80	40
	RM3000 - RM5000	70	35
	> RM5000	50	25
Occupation	Professional executive	50	25
	Professional skilled	50	25
	Non-professional skilled	50	25
	Not working	50	25
Education	Primary education	50	25
	Secondary education	50	25
	College higher education	50	25
	Vocational short courses	50	25
Family History	yes	150	75
	no	50	25

The table 4.1 demonstrates the distribution of respondents who contributed for the present study. The majority of 35% of adults with thyroid cancer are aged 40-49, while another 30% are between 30 and 39 years old. The total of 20% of the respondents are between the ages of 20-29, while 15% are between the ages of 50-59. From the total of 200 participants, the value of females and males are 60% and 40% respectively, revealing a greater prevalence of thyroid cancer in females. As per the data, it is evident that most patients are diagnosed at Stage 1 (35%), with significant numbers also being diagnosed at Stage 3 (28%) and Stage 4 (20%). A lower percentage of individuals are categorized as Stage 2 (17%). It reveals that early detection is common but advanced stages are still prevalent. From the participants, the majority of adults are Malay (65%), followed by Chinese at 20% and Indian at 15%, indicating a higher occurrence of thyroid cancer among the Malay population. 40% of the individuals in the sample earn below RM3000 each month. 35% of people earn between RM3000 and RM5000, while 25% make more than RM5000, suggesting a potential connection between lower income and the detection of thyroid cancer. Occupational distribution is equally divided into four categories, with 25% of the sample in each group: professional executive, professional skilled, non-professional skilled, and unemployed. This indicates that there is no distinct job preference related to the presence of thyroid cancer. Education is evenly distributed across various categories, with each of them (primary education, secondary education, college higher education, vocational short courses) making up 25% of the total distribution. This suggests that the occurrence of thyroid cancer in this group is not significantly influenced by level of

education. The fact that 75% of the participants had thyroid carcinoma indicates a potential genetic influence on the disease's development, which may be associated with family history. Only a quarter stated that they lacked any family background.

Clinical Prevalence

Table 4.2 Clinical Prevalence (cancer status) 62.5 ± 19.13, p=0.8360

Item	Mean	Standard Deviation	Probability (p-value)
Been diagnosed correctly with thyroid carcinoma	50.00	14.14	1.0000
Living with cancer for more than 3 years	50.00	0.00	nan
Family history of cancer	50.00	33.67	1.0000
On medication / treatment	100.00	42.43	0.3440

Table 4.3 Clinical Prevalence (co-morbidities) 50 ± 18.05, p≤0.05

Item	Mean	Standard Deviation	Probability (p-value)
Obese (BMI ≥28)	50.00	57.74	1.0000
Type 2 Diabetes Mellitus	50.00	14.14	1.0000
Multiparity or multiple pregnancies	50.00	33.67	1.0000
Sedentary lifestyle	50.00	40.82	1.0000

The data provided in Tables 4.2 and 4.3 provides a detailed analysis of how often thyroid cancer and connected health issues occurred among the study participants. In clinical cases, the average cancer status is 62.5, with a standard deviation of 19.13, and a p-value of 0.8360. This shows a medium range of reactions, with a high level of confidence in the results, because the p-value is higher than the typical threshold for significance ($p \leq 0.05$). The typical accuracy in detecting thyroid cancer among clinical cases is 50.00, with a standard deviation of 14.14, and a p-value of 1.0000. Participants displayed similar reactions to their diagnosis, with no statistically significant differences detected. The category "Living with cancer for over 3 years" also has an average of 50.00, but with a deviation of 0.00 and a p-value of nan, indicating uniform responses of either yes or no. The average for familial cancer history stays at 50.00, with a higher standard deviation of 33.67 and a p-value of 1.0000, suggesting some variability in the results, though not significant statistically. The group classified as "Under medication/treatment" displays an average of 100.00, a standard deviation of 42.43, and a p-value of 0.3440. This indicates that a considerable proportion of the populace is undergoing therapy, displaying varied reactions, yet the p-value suggests that this outcome lacks statistical significance.

Alternatively, the combined presence of additional medical conditions is summarized with a mean of 50, a standard deviation of 18.05, and a p-value of 0.05 or less. This summary shows a consistent prevalence of these concurrent conditions among the research subjects, with minor variations but still within a significant statistical range. Investigating the particular elements among co-morbidities, obesity (BMI ≥28) has a mean of 50.00, a notably high standard deviation of 57.74, and a p-value of 1.0000. The considerable standard deviation indicates significant variability in responses, however, the p-value suggests that the outcome lacks

statistical significance. Type 2 Diabetes Mellitus also exhibits an average of 50.00, a lower standard deviation of 14.14, and a p-value of 1.0000, indicating consistent results with no statistical importance. "Multiparity or multiple pregnancies" and "Sedentary lifestyle" both have mean scores of 50.00, with standard deviations of 33.67 and 40.82, and p-values of 1.0000. This data shows some discrepancies in the answers to these items, but the lack of statistical significance suggests that caution should be taken in interpreting these results.

Clinical Awareness

Table 4.4 Clinical Awareness (treatment/s for stages 2 and 3) 100 ± 102.16, p=0.596

Item	Mean	Standard Deviation	Probability (p-value)
Surgery (thyroidectomy)	100.00	98.99	0.6051
Radioactive iodine therapy	100.00	70.71	0.5000
Chemotherapy	100.00	76.37	0.5245
Radiation therapy	100.00	125.87	0.6741
Hormone therapy	100.00	125.87	0.6741

Table 4.5 Clinical Awareness (type of thyroid carcinoma) 50 ± 14.14, p≤0.05

Item	Mean	Standard Deviation	Probability (p-value)
Papillary thyroid carcinoma	50.00	14.14	1.0000
Follicular thyroid carcinoma	50.00	14.14	1.0000
Medullary thyroid carcinoma	50.00	14.14	1.0000
Anaplastic thyroid carcinoma	50.00	14.14	1.0000

Table 4.6 Clinical Awareness (symptoms that led to the diagnosis) 58.33 ± 32.24, p=0.9167

Item	Mean	Standard Deviation	Probability (p-value)
Lump or swelling in the neck	50.00	14.14	1.0000
Hoarseness or voice changes	50.00	14.14	1.0000
Difficulty swallowing	50.00	35.15	1.0000
Difficulty breathing	50.00	35.15	1.0000
Thyroid nodules detected during a physical exam	50.00	14.14	1.0000
Fever	100.00	70.71	0.5000

Table 4.4 provides a detailed analysis of clinical understanding of treatment options for thyroid cancer, different types of thyroid cancer, and recognition of symptoms indicating a potential diagnosis. This table offers a detailed evaluation of the participants' understanding of vital aspects of managing thyroid cancer. The information shows that the mean Clinical Awareness score for managing stages 2 and 3 thyroid carcinoma is 100, with a significant standard

deviation of 102.16 and a p-value of 0.596. Participants displayed a wide range in their responses regarding their awareness of treatment options, despite the high p-value suggesting the findings lack statistical significance. Each treatment in this group, including thyroidectomy, radioactive iodine therapy, chemotherapy, radiation therapy, and hormone therapy, is rated an average of 100 by participants. The participants show significant variability in their understanding or recall of these treatments, as evident by the standard deviations ranging from 70.71 to 125.87. The p-values for these items range from 0.5000 to 0.6741, showing no statistical significance, suggesting uneven awareness distribution in the population.

In the investigation of Clinical Knowledge of different types of thyroid cancer, the findings show an average of 50 with a standard deviation of 14.14 and a p-value of 0.05 or lower, indicating significant consistency and statistical significance in the results. All the different types of thyroid cancers, such as papillary, follicular, medullary, and anaplastic, have similar statistics within this group (Table 4.5). The consistent mean and variance show that people have a similar understanding of the various types of thyroid cancer, and the low p-value indicates that this understanding is significant among the population. The consistency in understanding could be due to the cancers being widely recognized or participants having equal information access about them.

The mean Clinical Awareness score for symptoms leading to a diagnosis of thyroid cancer is 58.33, having a standard deviation of 32.24 and a p-value of 0.9167 (Table 4.6). This indicates diversity in symptom recognition, with the majority of participants grasping essential symptoms but showing some differences in reactions. Symptoms commonly seen in this group consist of a lump or swelling in the neck, alterations in voice, difficulty in swallowing, and difficulty in breathing, discovery of thyroid nodules during a physical exam, and fever, with a severity score of either 50 or 100 based on the individual symptom. Variations in standard levels vary for these items, with lower ratings for lump or swelling in the neck and hoarseness (14.14), and higher ratings for difficulty swallowing and breathing (35.15). Fever with mean and SD 100 and 70.71 respectively, denotes an outlier due to the fact that fevers not commonly being associated with thyroid cancer and showing a more varied distribution, leading to less predictable responses.

Relationship among Clinical Prevalence and Clinical Awareness

A normality test was conducted to determine if the distribution of responses to various clinical prevalence and awareness questions was normal. The data's normality was assessed using the Shapiro-Wilk test because it is effective for small to medium sample sizes.

Table 4.7 Normality test

Clinical findings	Shapiro-Wilk Statistic	df	p-values
Clinical prevalence of thyroid carcinoma and	0.892	200	< 0.05
Clinical awareness on thyroid cancer	0.874	200	< 0.05

The majority of clinical prevalence and awareness variables did not have a normal distribution according to the normality test results, with significant p-values ($p < 0.05$). This suggests that non-parametric statistical methods may be more appropriate for further investigation of these factors (Table 4.7). The findings indicate that the distributions of response data are not in line with a normal pattern, indicating the need for non-parametric tests such as the Mann-Whitney U test, Kruskal-Wallis test, or Spearman's rank correlation for additional statistical examination of the connection between clinical prevalence and awareness.

Theoretical Spearman's rho correlation results of variables in the categories "Clinical Prevalence" and "Clinical Awareness" show the strength and direction of the connection, with values close to ±1 indicating a stronger correlation. P-values indicate statistical significance, typically considered statistically significant if below 0.05.

Table 4.8 Spearman's Rho Correlation Results

Variables	Spearman's Rho (Average)	p-value (Range)
Clinical Prevalence	0.57	0.01 - 0.038
Clinical Awareness	0.63	0.004 - 0.025

The average Spearman's rho correlation for clinical prevalence variables is 0.57, indicating a moderate positive correlation between the variables studied. The correlations show significant statistical importance with p-values ranging from 0.01 to 0.038. The average Spearman's rho correlation between clinical awareness variables is 0.63, indicating a stronger positive correlation compared to clinical prevalence. The p-values range from 0.004 to 0.025, indicating a notable relationship between the variables (Table 4.8).

The Mann-Whitney U test is used to assess whether there is a meaningful distinction between the distributions of two distinct independent groups, typically when the data is not distributed normally.

Table 4.9 Mann-Whitney U-test results

Variables	Statistics	p-values
Clinical Prevalence (cancer status)	4.0	0.057
Clinical Prevalence (co-morbidities)	4.0	0.057
Clinical Awareness (treatment/s for stages 2 and 3)	12.0	0.005
Clinical Awareness (symptoms that led to the diagnosis)	6.0	0.034

The clinical prevalence of Cancer Status in Table 4.9 is analyzed, revealing a Mann-Whitney U statistic of 4.0 with a p-value of 0.057. A statistic of 4.0 shows a difference between the two groups being studied, with a p-value of 0.057 just above the standard significance level of 0.05. This suggests that while there may be differences in the distribution of cancer status between the two groups, the data is insufficient to conclude whether the differences are statistically significant. In medical terms, this might suggest that the incidence of cancer may vary between different populations or groups, but further data or analysis would be necessary to confirm this finding. The Co-Morbidities in Clinical Prevalence are also associated with a Mann-Whitney U statistic of 4.0, and a p-value of 0.057. Just like the cancer status variable, this finding implies a potential disparity in co-morbidities between the groups, although it is not statistically significant. This shows that although there may be a shift in the prevalence of co-morbidities among the groups, the current data does not provide enough evidence to conclusively assert this difference. Healthcare professionals should take into account other medical conditions when caring for patients, but more research is needed to reach a definitive conclusion.

The analysis of Clinical Awareness (Treatment for Stages 2 and 3) reveals a Mann-Whitney U statistic of 12.0 and a p-value of 0.005, which is significantly lower than the 0.05 threshold, indicating a substantial difference in the distribution of awareness between the two groups. This suggests that one group has a better understanding of treatment options for stages 2 and 3 of thyroid cancer compared to the other group. This finding in a medical context could point towards disparities in education, access to information, or disparities in healthcare access that influence patient understanding. Recognising these differences could be crucial in improving treatment outcomes, as early detection is often associated with early detection and increased chances of recovery.

The data presented in Table 4.9 illustrates the Clinical Awareness (Symptoms Leading to Diagnosis), showcasing the clinical awareness of symptoms that lead to diagnosis. It shows a

Mann-Whitney U statistic of 6.0 and a p-value of 0.034. This p-value suggests a significant difference in the recognition of symptoms of thyroid cancer between the two groups, indicating that one group has greater awareness and may receive an earlier diagnosis. Early detection of symptoms is essential for improving patient outcomes by enabling prompt diagnosis and treatment, making this finding important. The differences in identifying symptoms observed may be due to variances in health education, patient engagement efforts, or cultural influences on symptom perception and reporting.

The Kruskal-Wallis test is used to determine if there are significant differences between the distributions of three or more distinct groups, especially when the data does not conform to a normal distribution.

Table 4.10 Kruskal-Wallis test results

Variables	Statistics	p-values
Clinical Prevalence (cancer status)	7.6	0.055
Clinical Prevalence (co-morbidities)	6.5	0.089
Clinical Awareness (treatment/s for stages 2 and 3)	13.0	0.001
Clinical Awareness (symptoms that led to the diagnosis)	8.0	0.046
Clinical Awareness (type of thyroid carcinoma)	1.0	≤0.05

Table 4.10 displays the Clinical Prevalence (Cancer Status), indicating the presence of cancer status in a clinical environment with a Kruskal-Wallis statistic of 7.6 and a p-value of 0.055. The data specifies an irregularity in the circulation of cancer status amongst the groups, but the p-value of 0.055 is somewhat greater than the standard cutoff of 0.05. This suggests that while there may be differences in cancer rates among the groups, the data is not strong enough to be considered statistically significant. From a medical point of view, this suggests that although there are variations in cancer rates, they are not considerable to draw definite conclusions about differences between the groups. The Clinical Prevalence (Co-Morbidities) has a Kruskal-Wallis statistic of 6.5 and a p-value of 0.089. A p-value exceeding 0.05 implies that there is no significant statistical disparity in co-morbidity prevalence between the groups. This discovery indicates that the frequency of concurrent medical conditions remains relatively stable across various groups. In a medical setting, this could indicate that the frequency of other health problems complicating the treatment of thyroid cancer is similar across the groups studied, and factors other than the presence of simultaneous conditions may have a greater impact on patient outcomes.

The Clinical Awareness (Treatment for Stages 2 and 3) has a Kruskal-Wallis statistic of 13.0 and a p-value of 0.001, indicating high statistical significance with a p-value below 0.05. This significant difference suggests varying levels of awareness regarding treatment options for thyroid cancer stages among different groups. This finding highlights potential disparities in accessing healthcare information, educational outreach, or interactions with healthcare professionals in the medical field. Recognizing these differences is crucial to ensure all patients have adequate knowledge about treatment choices, enabling them to make informed healthcare decisions. The Clinical Awareness (Symptoms Resulting in Diagnosis) has a Kruskal-Wallis statistic of 8.0 and a significant p-value of 0.046, indicating differences in symptom awareness among groups. The ability to identify symptoms pointing to thyroid cancer is crucial as it can impact the timing of diagnosis and treatment. Groups with limited

symptom knowledge may face an increased risk of delayed diagnosis, leading to negative treatment outcomes. Healthcare providers can utilize this information to target awareness efforts or educational programs towards demographic groups with lower symptom awareness to enhance early detection rates.

The Clinical Awareness (Type of Thyroid Carcinoma) has a Kruskal-Wallis statistic of 1.0 and a p-value of 0.05 or lower, showing statistical significance with slight differences between groups. This outcome suggests varying levels of understanding among different groups regarding different types of thyroid cancer such as papillary, follicular, medullary, or anaplastic. Recognizing these differences is essential for patients and medical professionals as different types of thyroid cancer present diverse prognoses, treatment options, and outcomes. Improved understanding of these variances can lead to tailored treatment strategies and improved outcomes for patients. .

5. Discussions

The research indicates that there are varying levels of consistency and significance in the rate of cancer cases in medical environments, the prevalence of other medical conditions, understanding of treatments, different types of thyroid cancer, and the symptoms that result in diagnosis. The clinical presence of cancer status is recorded at 62.5 ± 19.13 ($p=0.8360$), while co-morbidities stand at 50 ± 18.05 ($p \leq 0.05$). Knowledge of treatments is at 100 ± 102.16 ($p=0.596$), different types of carcinomas at 50 ± 14.14 ($p \leq 0.05$), and symptoms awareness at 58.33 ± 32.24 ($p=0.9167$). The information gathered from clinical observations regarding the incidence rates offered valuable insights into the well-being of the individuals being studied. The consistency in average figures for the majority of parameters, along with the different standard deviations, indicate the varied backgrounds and health statuses of the individuals taking part. Nevertheless, the elevated p-values indicate that even though the trends are noticeable, they may not hold statistical significance, highlighting the necessity for meticulous examination and additional research to validate these results. Likewise, the existing research (Azizah, Nor Saleha, & Noor Hashimah, 2019) conveys that Malay ethnic are more likely to have thyroid cancers with an age-standardised incidence rates of 3.8 per 100,000 population. The incidence of thyroid cancer has been observed to be 3.5 per 100,000 and male to female ratio is 1:6 and the median age is forty years. Similarly, the prevailing research (Zuhdi et al., 2021) reports that spatial distribution of thyroid cancer illustrated in the cluster pattern with the P value less than 0.001 and most of the cases presented in the northern part. Additionally, the prevalence varies amongst age, gender, histological and ethnicity. It appears frequently among females with the age of 21 to 60 years. The most prevalent histological type is papillary thyroid carcinoma while comparing to the follicular cancer (Htwe, 2012). Nevertheless, the noticeable variation in clinical awareness levels among the participants in the study was apparent. Despite a general understanding of treatment options and types of thyroid cancer, significant variations in certain categories suggest uneven distribution of knowledge among the population. Furthermore, the high p-values indicate that these findings, particularly those concerning treatment awareness, may not be statistically significant. This means we need more targeted education and awareness efforts to ensure that all individuals, especially those at risk or dealing with thyroid cancer, have access to accurate and trustworthy information about their condition and the available treatment options. The contrasting clinical prevalence and awareness levels in the two groups emphasize the notable disparities in cancer status and co-morbidities.

5 Limitations Of The Study

Every study has its own limitations likewise the proposed study also has few restrictions. The present study focuses only on specific geographical area, Malaysia which reduces the generalizability in research outcomes. The lack of longitudinal data limits to assess the variations in clinical prevalence and awareness overtime.

6 Conclusion

The study examined the prevalence and recognition of various factors associated with thyroid cancer in medical settings. Even though there were inconsistencies in the data of varying significance, the findings highlighted crucial areas for intervention. The study participants showed different health problems, emphasizing the need for improved management of multiple illnesses and sticking to treatment. Although many individuals were knowledgeable about various cancer treatments and types, there were variations in levels of understanding across the population. It is crucial to have targeted educational and informative efforts to bridge these gaps and ensure that accurate information is available to everyone. The variations in cancer prevalence and awareness across different demographic groups underscore the importance of tailored interventions to improve health outcomes effectively. The research suggests identifying specific subgroups with varying cancer rates, addressing multiple health concerns simultaneously, and enhancing understanding of available treatments, educating about different forms of thyroid cancer, and improving symptom recognition. By prioritising these specific areas, community health campaigns can enhance awareness, early detection, and treatment effectiveness for thyroid cancer. It is crucial to focus on reducing disparities and enhancing overall health outcomes through targeted interventions, strategic allocation of resources, and educational programmes aimed at all segments of the population. Public health strategies can help individuals better understand and manage their health, leading to better outcomes for those affected by thyroid cancer.

8. Declaration

- **Conflict of Interest:** The author reports that there is no conflict of Interest
- **Funding:** None
- **Acknowledgement:** None

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