



ST. PAUL'S HOSPITAL MILLENNIUM MEDICAL COLLEGE

PREVALENCE AND FACTORS ASSOCIATED WITH PULMONARY NODULE IN ST
PAUL'S HOSPITAL MILLENNIUM MEDICAL COLLEGE, ADDIS ABABA, ETHIOPIA

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A RESEARCH THESIS SUBMITTED TO DEPARTMENTS OF INTERNAL MEDICINE
AND PUBLIC HEALTH, SPHMMC, IN PARTIAL FULFILLMENT OF THE
REQUIREMENT FOR SPECIALTY CERTIFICATE IN INTERNAL MEDICINE.

FEBRUARY 2024

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Abbreviations and acronyms

CI	Confidence interval
CT	Computed Tomography
MRN	Medical Registration Number
OR	Odds Ratio
PN	Pulmonary Nodule
SPHMMC	Saint Paul's hospital millennium medical collage
PI	Principal investigator
AD	Advisor
TB	Tuberculosis
CKD	Chronic kidney disease
COPD	Chronic obstructive pulmonary disease
GG	Ground glass
HTN	hypertension

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Summary

Background: Pulmonary nodules are common incidental findings, but information about their incidence in the era of computed tomography (CT) is lacking. Lung nodules are the most common and typical indicators of an early-stage lung cancer. Worldwide, lung cancer has become the leading cause of cancer-related morbidity and mortality. Pulmonary nodules are common, with at least 1.5 million nodules discovered annually. Despite this problem the prevalence and associated factors towards pulmonary nodule is not conducted in Ethiopia Yet. This study used as baseline information for researchers for further investigations.

Objective: To assess the magnitude of pulmonary nodules and its associated factors among patients in St. Paul's hospital chest clinic who undergo chest CT scan, central Ethiopia, 2024.

Methods: An institution based cross-sectional study is conducted from May, 2023 to December, 2023 at St. Paul's hospital. Simple random sampling technique is used to select 289 charts. The data is collected by four trained health professionals. A retrospective chart review method is used for data collection. The collected data is entered to Epi- data and SPSS 29 is used for analysis. Descriptive statistics employed. Logistic regression (both bivariable and multivariable) is fitted to identify the significant variables. Model fitness is checked using the Hosmer-Lemeshow goodness of fit test. An adjusted odds ratio with the 95% of corresponding confidence interval and P-value of 0.05 used to declare the significant variables.

Results: Among total participants, 177(63.21%) of participants have previous history of lung disease. As far as previous history of cancer is concerned 34(12.06%) of patients have history cancer. Among total participants 43(15.25%) are smokers, from which 5(1.77%) are active smoker and 29(10.28%) stop smoking in the last 15 years. Number of pack year of cigarettes smoked (mean $\pm$ SD) is 11.49 $\pm$ 6.42. In multi-variable analysis chronic lung disease is 2.233 times more likely to cause pulmonary nodule, AOR: 2.233 (95%CI: 1.301, 3.833) and smoking of more than 100 cigarette in life time is 2.791 times more likely to cause pulmonary nodule, AOR: 2.233(95%CI: 1.406, 5.540).

Conclusion: The prevalence of pulmonary nodule is high(29.43%) and cigarette smoking and history of chronic lung disease are significantly associated with pulmonary nodule.

1. Introduction

1.1 Background

Pulmonary nodule is a small abnormal area that can be found during a computed tomography (CT) scan of the chest conducted as part of screening or to check the lungs if clients have the symptoms [1]. It is a rounded or poorly defined opacity, measuring up to 3 cm in diameter, surrounded by aerated lung on radiological imaging and when an opacity's size is less than 3mm we referred it as a micro-nodule [2]. However, a rib fracture, a skin lesion, a device on the surface of the patient, anatomic variants, or composite areas of increased opacity may mimics a pulmonary nodule and we call them A pseudo-nodule [3].

In recent days, it becomes an increasingly common consequence of routine medical care encountered in clinical practice with an incidence that is much greater than recognized previously due to more frequent use of CT imaging as a diagnostic tool [4, 5], and to a lesser extent, more vigilant detection of nodules on any given CT scan [5].

Even if most pulmonary nodules seen on CT scans are the result of old infections, scar tissue, or other causes, tests are often needed to be sure a nodule is not cancer [1]. Prognosis is generally dependent primarily on the characteristics of the pulmonary nodule and they may not necessarily require treatment. However, those with multiple risk factors and malignant features on imaging studies have a poorer prognosis [8, 9].

1.2 Statement of the problem

Between 2006 and 2012, 1.57 million American adults were diagnosed with pulmonary nodule from 4.8 million adults underwent at least one chest CT. Which indicates the frequency of pulmonary nodule identification increased from 24 to 31% for all CT scans performed, making a rate of nodule identification escalated from 3.9 to 6.6 per 1,000 person-years [5, 6].

Pulmonary nodule may complicate into, hemorrhage, pulmonary embolism, infections (empyema, pneumonia, surgical site), pleural effusions, pneumothorax, myocardial infarction and central neurological event [7, 8]. These complications are usually arise due to invasive treatment options such as surgical resection [7]. Moreover, nodule detection is critical since clinicians' risk becoming inundated with patients with the diagnosis that require evaluation. Almost everyone with a nodule has a risk of suffering from psychological harm since they undergo radiographic surveillance rather than biopsy, leaving them in a state of uncertainty for months or years about whether they have malignancy [9] since the prevalence of malignancy among pulmonary nodules ranges between 0.2% to 50% [10]. Optimal treatment of an individual with a pulmonary nodule can lead to early detection of cancer while minimizing testing for a benign nodule [6].

Evaluating pulmonary nodules is clinically important, because they may be early predictors of lung cancer [11]. According to a study conducted in Ethiopia, lung nodule was a clinical characteristic among 84.9% of lung cancer patients [12]. Despite the use of thoracic imaging with CT for the diagnosis of pulmonary nodule is increasing over time, [4, 5] there is a dearth of basic information about their epidemiology. More frequently, their diagnosis has not been accompanied by increases in cancerous nodules [5]. Studying the magnitude and factors related with pulmonary nodules is critical to guide clinical policy in the current era of advanced imaging [5]. Having the basic knowledge about the problem will allow health care practitioner to diagnose and treat individuals early with minimum morbidity from invasive procedures for patients with benign lesions [13].

2.Literature review

2.1.Magnitude of pulmonary nodule

The diagnosis of pulmonary nodules (PNs) in the general population are incidental which ranges between 0.09% to 7% [10] and found on 13% of CT scans [14]. According to a study conducted among patients underwent a computed tomography thorax as part of their trauma assessment in Australia, 8.5% had incidental pulmonary nodules [15]. A study conducted in Germany among children without malignant disease using multi-row CT revealed that 33% of the participants had pulmonary nodules [16]. Another Prospective cohort study conducted in north china indicated that 26.23% had pulmonary nodules[17].

According to a study conducted among World Trade Center Rescue and Recovery Workers, the prevalence of PN detected by CT scan was 60% with 52% having at least one non-calcified solid nodule [18]. Another study indicated that the prevalence of non-calcified lung nodules has been reported as 33% and 13% among a screening (recruited asymptomatic people at higher risk of lung cancer) and non-screening study population, respectively. Another study also indicated that the of prevalence of sub-solid PN with size ≥ 4 mm was 24% [19].

2.2. Factors related with PN

Different previous studies have been explained that different socio demographic, clinical and health related factors are related with pulmonary nodule. Factors like age [10, 17, 20-23], female gender[24], tobacco smoking status [10, 17, 20-23, 25], exposure to second-hand smoke (SHS) at work [17], exposure to dust exposure [17] and toxic environment [25], low fruit intake [17], history of lung disease [17], dyspnea symptom [21] prior history of cancer [10, 17, 23, 25, 26], tobacco use [10, 23], and family history of cancer [17] were associated with pulmonary nodules. Pulmonary nodules especially the benign, can be caused by inflammation from Bacterial infections (tuberculosis and pneumonia), Fungal infections, (histoplasmosis, coccidio-mycosis or aspergillosis), Lung cysts and abscesses, small collections of normal cells, called hamartoma, Rheumatoid arthritis, Sarcoidosis [25, 27].

In contrast to these findings, other studies indicated that smoking, asbestos exposure history [21], age or prior malignancy [24] were not associated with pulmonary nodules. And another prospective study conducted in china indicated that consumption of vegetables, tea and legumes reduced the risk of PNs [17].

2.3. Conceptual framework

Pulmonary nodule has been related with different factors. This conceptual framework will be utilized to investigate the interrelationship between variables. Predictor variables were grouped into socio-demographic, health related, behavioral, nutritional and environmental factors. The interrelationship between outcome variable and other predictor variables was explained in **Error! Reference source not found.**

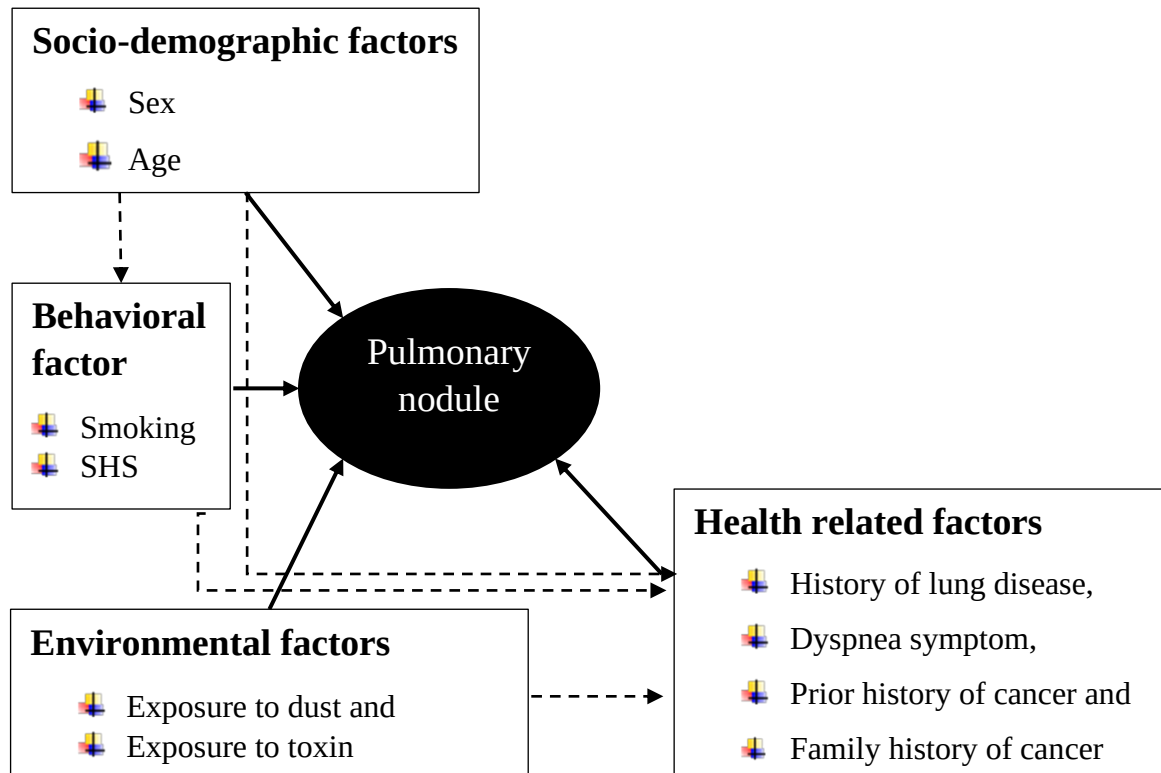


Figure 1: Conceptual frame work which shows the relationship between different factors with pulmonary nodules developed based on [10, 17, 20-25, 27]

3. Justification of the study

Pulmonary nodules are common incidental findings, but information about their incidence in the era of computed tomography (CT) is lacking. Lung nodules are the most common and typical indicators of an early-stage lung cancer. However, most studies regarding PN are conducted decades ago and there is a paucity of updated information.

Early recognition and treatment of PN have a potential to alter the trajectory of other serious medical disorders like cancer. Although there are some studies, which explains the problem in a specific population group, the magnitude of PN as a whole has not previously been explored in our country.

Hence exploring magnitude of PN and determinant factors among patients who visit a chest clinic may provide the burden of the disease in our country and would shed light on the phenomenology of the problems and enable targeted early diagnosis and therapeutic interventions for vulnerable peoples. The result of this study will provide important information to health practitioners about the importance of early management of incidentally discovered pulmonary nodules.

This research will create awareness about the magnitude and determinant factors of PN, provide baseline information for researchers for further investigations and it will serve as evidence for those policy makers and program planner to decrease the incidence of lung cancer.

4.Objectives

4.1 General objective

- ❖ The main aim of the study is to assess the prevalence and associated factors towards pulmonary nodules among patients visited St. Paul's hospital millennium medical college chest clinic.

4.2. Specific Objectives

- ❖ To determine the prevalence of pulmonary nodules among patients who visited St. Paul's hospital millennium medical college chest clinic who undergo chest CT scan
- ❖ To identify factors associated with pulmonary nodules among patients in St. Paul's hospital millennium medical college chest clinic who undergo chest CT scan

5.Methods and materials

5.1.Study design and period

An institution based retrospective cross-sectional study is conducted from march 2023 to December 2023

5.2.Study setting

The study is be conducted at St. Paul's hospital millennium medical college. It was established through a decree of the Council of Ministers in 2010, although the medical school opened in 2007 and the hospital was established in 1968 by the late Emperor Haile Selassie. The College initiated Ethiopia's first integrated modular and hybrid problem-based curriculum for its undergraduate medical education, and is currently expanding to postgraduate programs and diversifying its undergraduate program offerings. Currently it has 250 faculty members and expanding teaching facilities. The college has more than 2800 clinical, academic and administrative and support staffs that provide medical specialty services to patients who are referred from all over the country, teaching medicine and nursing students and doing basic and applied researches. While the inpatient capacity is more than 700 beds, The College sees an average of 1200 emergency and outpatient clients daily.

The College provides healthcare and training through its different biomedical and clinical departments, including Anatomy, Physiology, Biochemistry, Pharmacology, Public health, Pathology, General Surgery, Internal Medicine, Obstetrics and Gynecology, Pediatrics and child health, Emergency Medicine, Urology, Neurology, Orthopedics, Psychiatry, Ophthalmology, ENT, Dentistry and Maxillofacial Surgery, Radiology, Anesthesiology, Nursing, ICU (Intensive Care Unit), ART (HIV care), Endoscopy, Physiotherapy, Laboratory and Pharmacy [28].

5.3 Population

5.3.1Source population

All patients who had a chest CT scan test at St. Paul's hospital millennium medical college chest clinic for any indication from April 2020 up to December 2023

5.3.2 Study population

All patients who had a chest CT scan test at St. Paul's hospital millennium medical college chest clinic for any indication and selected for the study

5.4 Eligibility criteria's

5.4.1 Inclusion criteria's

All adults (age ≥ 18 years) patients who had at least one chest CT scan test between April 2020 and September 2023 at St. Paul's hospital millennium medical college chest clinic for any indication and selected for the study were included. Participants with incomplete data are excluded

5.5 Sample size determination

The sample size for the first objective is determined using a single population proportion formula with the assumption of confidence level of 95%, margin of error of 5% with there is no any previous a study conducted in Ethiopia so, take 50%.

$$n = (Z_{\alpha/2})^2 p (1-p) / d^2$$

Where n=sample size

Z= 95% confidence interval (1.96)

P= prevalence = 50%

d = margin of error = 0.05

$$n = (Z_{\alpha/2})^2 p (1-p) / d^2$$

= $(1.96 \times 1.96) \times 0.5 \times 0.5 / (0.05 \times 0.05) = 384$, considering 10% attrition rate the final calculated sample will be 423. Finally using finite population proportion formula sample size is 289

5.6 Sampling procedures

The list

f all eligible participants will be obtained in soft copy from the chest clinic. Simple random sampling will be applied to select the study participants. Computer generated simple random sampling method using Medical Registration Number (MRN) will be carried out.

6. Variables of the study

6.1 Outcome variables

Pulmonary nodule

6.2. Independent variables

Socio demographic factors: sex and age

Health related factors: history of lung disease, dyspnea symptom, prior history of cancer, family history of cancer

Behavioral factor: smoking

Environmental factors: exposure to dust

7. Operational definition

Pulmonary nodule: focal opacity measuring 3cm or less in diameter, that may be solitary or multiple [2, 29].

Ever smoker: referred to as an individual who had ever tried to smoked cigarettes during his/her life time [30].

Current smokers: Currently smoking cigarettes daily or regularly [31].

8.Data collection procedures (Instrument and personnel)

Structured data extraction check list is developed based on the research design, research problem, purpose and objectives, patient follow up and chest clinic guide lines. Trained health professionals working in chest clinic collected the data and recruited supervisors monitored the data collection.

8.1 Data quality Control

Pretest is be done to check for tool consistency and relevance. Two days training is given for data collectors and supervisors. Strict follow up and supervision is carried out during data collection.

8.2 Data processing and analysis

Data entry template is developed on Epi-data version 4.61. Then data entered and exported for further analysis to SPSS version 29 Statistical software used for analysis purposes. Descriptive Analysis conducted to summarize variables through generating frequency table, percentage, mean or median and graph/charts according to the nature of variables. Binary logistic regression analysis (both Bi-variable and multivariable) employed to identify factors that have association with the dependent variables. P-value less than 0.25 were considered as a cut of point to select variables during bi-variable logistic regression for the final model multivariable logistic regression. Finally, the degree of relationship is interpreted based on adjusted odds ratio with 95% confidence interval (CI) and corresponding p-value ($p < 0.05$).

8.3 Ethical Considerations

Ethical approval was obtained from the ethical review committee of St. Paul's hospital millennium medical college. Letter of cooperation have been obtained from St. Paul's hospital millennium medical college. Furthermore, anonymous medical registration cards are only used as an identification number and confidentiality reserved for all forms of information

8.3 Dissemination of the result

The result of this study will be presented and submitted to St. Paul's hospital millennium medical college. It will be also presented at different research symposium, work shop and seminars organized both at national and international communities. Finally, it will be published on internationally reputable journal to be kept and disseminated for scientific communities.

9.Results

9.1 Socio-demographic Characteristics of the Respondents

A total 282 study participants were included in this study. The mean (SD) ages of the respondents were $50.89 \pm SD 15.5$ years. Regarding education of the respondents' 15(5.32%) and 96(34.04%) educational level were primary and tertiary school respectively. Nearly one third of 282 (28.72%) respondents had no formal education, 131 (23.21%) of participants are government employee and 120(42.86% are working private job (**Table 1**)

Table 1: Socio-demographic characteristics of patients with chest CT, SPHMMC, Addis Ababa, Ethiopia, 2024 (n=282)

Variables	Category	Frequency	Percentage (%)
Sex	Female	146	51.77
	Male	136	48.23
Marital status	Married	210	74.47
	Single	46	16.31
	Divorced	10	3.55
	Widowed	16	5.67
Educational status	Informal	81	28.72
	Primary	15	5.32
	Secondary	90	31.90
	Tertiary	96	34.04
Occupation	Government employee	131	23.21
	Private	120	42.86
	Student	10	3.57
	Daily Laborer	13	4.64
	House Wife	6	2.14
	Farmer	66	23.57
Age	<35	54	19.22
	35-39	18	6.41
	40-49	53	18.86
	50-59	64	22.78
	>60	92	32.74

9.2 Prevalence of pulmonary nodule

This study is conducted among 282 participants who had chest CT scan at SPHMMC chest clinic done in last 3 years and the prevalence of pulmonary nodule is found to be 29.43%

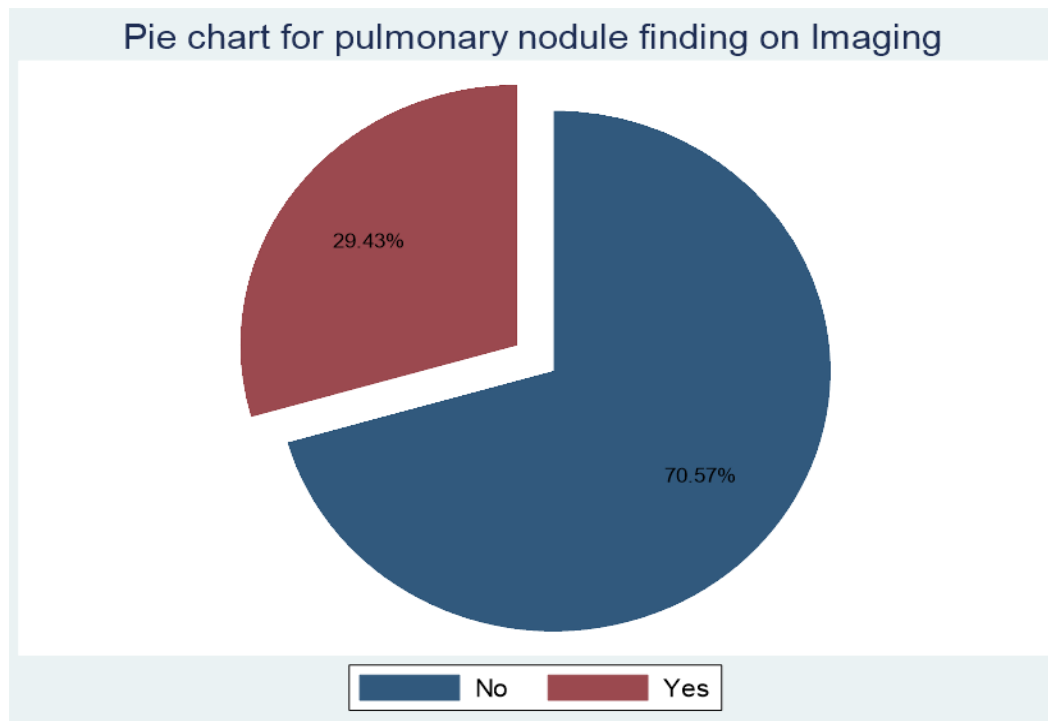


Figure 2: Pie chart of pulmonary nodule among participants attending in St Paulo's hospital 2024

9.3 Variables associated with pulmonary nodule

Among total participants 177(63.21%) of patients have previous history of lung disease

As far as previous history of cancer is concerned 34(12.06%) of patients have history cancer

Among total participants 43(15.25%) are smokers, from which 5(1.77%) are active smoker and 29(10.28%) stop smoking in the last 15 years.

Number of pack year of cigarettes smoked(mean $\pm$ SD) is 11.49 $\pm$ 6.42

Table 2:factors associated with pulmonary nodule

Variables	Category	Frequency	Percentage (%)
History of lung disease	Yes	177	63.21
	No	103	36.79
Previous hx of cancer	Yes	34	12.06
	no	247	87.59
Smoking more than 100 cigarettes	yes	43	15.25
	No	239	84.75
No. Years since quitting smoking	Less than 15 years	29	10.28
	More than 15 years	11	3.9
	Active smoker	5	1.77

9.4 Imaging characteristics of pulmonary nodule

Among 67 participants who have pulmonary nodule 28(41.79%) measures between 5 mm and 8 mm,25(37.31%) measures between 8 mm and 20 mm,4(5.97%) measures above 20 mm and the remaining measures below 5 mm but for the remaining 5 patients size is not mentioned on the imaging

Among patients who have pulmonary nodule 63(76.83%) have single nodule and 19(23.17%) have multiple nodule

Table 3:imaging characteristics of pulmonary nodule

Variable	Category	Frequency	Percent (%)
Size of nodule	<5 mm	10	14.93
	5-8 mm	28	41.79
	8-20 mm	25	37.31
	>20 mm	4	5.97
Number of nodule	single	63	76.83
	multiple	19	23.17
Morphology of nodule	Solid	45	15.96
	Pure GG	27	9.57
	Part solid	11	3.9

Location of nodule	Upper lobe	64	22.70
	Lower lobe	24	8.51
	Middle lobe	22	7.8
	perifisural	9	3.19
Shape of nodule	Have smooth border	61	21.63
	Have speculation	19	6.74
	Have emphysema	5	1.77
Repeat imaging done	Yes	49	17.38
	No	33	11.7
Progress of nodule on repeat imaging	Increasing	10	3.55
	Similar	18	6.38
	Decreasing	16	5.67
	resolve	7	2.48
Biopsy,FNAC done	Yes	7	2.48
	no	73	25.89
Biopsy result	Adenocarcinoma of lung	3	3.61
	Nonspecific interstitial inflammation of alveolar space	2	2.4
	TB	1	1.2
	Result not available	1	1.2

9.5 Frequency of comorbidities

Frequency analysis was run for multiple response questions about comorbidities disease COPD accounts 61(23.7%), followed by type 2 DM 35(13.6%), heart failure 14(5.4%), CKD 11 (4.3%), Liver disease 10(3.9%), RVI 9(3.5%), rheumatic conditions 8 (3.1%), stroke 3 (1.2%), and other conditions takes the majority of comorbidities with 106 (41.2%) and among the other comorbidities HTN accounts the majority 76(26.95%), cross tabulation was done to assess the association between comorbidity disease and this study dependent variable but no significant association seen.

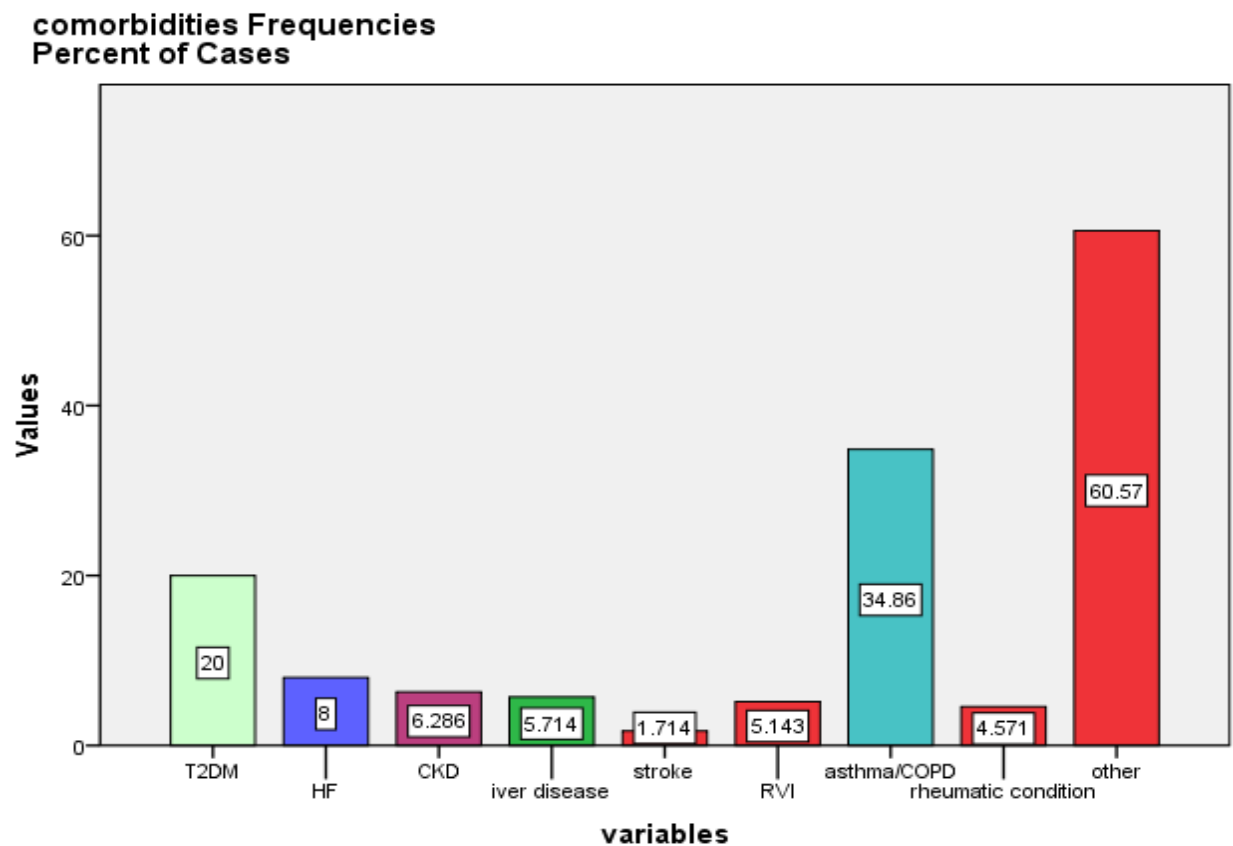


Figure 3:frequency of comorbidity disease of patients presented at SPHMMC, 2023

9.5 Factors associated with pulmonary nodule

Initially, cross tabulation were done for all variables to see existence of association between dependent and independent variables. Then, bi-variable and multi variable analyses were done to determine factors associated with pulmonary nodules.

In bivariable analysis sex, age, residence, chronic lung disease and patients who smoke more than 100 cigarettes in their life time, previous history of cancer are significantly associated with p-value <0.25. When the multivariable analysis was done patients who have chronic lung disease, and patients who smoke more than 100 cigarettes in their life time were the only variables associated with a p-value of < 0.05. In multi-variable analysis variables such as chronic lung disease is 2.233 times more likely to cause pulmonary nodule, AOR: 2.233 (95%CI: 1.301, 3.833) and smoking of more than 100 cigarette in life time is 2.791 times more likely to cause pulmonary nodule, AOR: 2.233(95%CI: 1.406, 5.540). The above two variables were significantly associated with pulmonary nodules at the p-value of 0.05 with 95% CI.

Table 4: Bivariable and multivariable logistic regression of factors associated with pulmonary nodule SPHMMC Addis Ababa ,Ethiopia 2023 (N=282)

Variables	Categories	Factors associated with pulmonary nodules		COR (95% CI)	p-value	AOR (95% CI)
		Yes	No			
Sex	Male	42(30.9%)	94(69.1%)	1		
	Female	41(28.1%)	105(69.2%)	1.1	0.4	0.745(0.328-1.706)
Age	<35	21(38.9%)	33(61.1%)	1		
	35-39	6(31.6%)	13(68.4%)	1.3	0.61	0.64(0.11-3.52)

	40-49	15(28.3%)	38(71.7%)	1.4	0.25	0.38(0.76-1.95)
	50-59	18(28.1%)	46(71.9%)	1.6	0.7	0.75(0.16-3.45)
	>60	23(25.0%)	69(75.0%)	1.9	0.65	1.39(0.32-5.94)
Marital status	Divorce	3(30.0%)	7(70.0%)	1		
	Married	59(28.1%)	151(71.9%)	1.09		
	Single	17(37.0%)	29(63.0%)	0.73	1.93	2.4(1.244-3.0)
	Widowed	4(25.0%)	12(75.0%)	1.28		
Educational status	informal	17(21.0%)	64(79.0%)	1		
	Primary	8(53.3%)	7(46.7%)	0.23	0.9	0.14(0.03-0.54)
	Secondary	28(31.1%)	62(68.9%)	0.58		
	Tertiary	30(31.3%)	66(68.8%)	0.584		
Residence	Urban	56(35.0%)	104(65.0%)	1		
	Rural	27(22.1%)	95(77.9%)	1.89	0.01	27.6(1.879-405.78)
History of chronic lung disease	Yes	43(24.0%)	40(38.8%)	1		
	No	136(76.0%)	63(61.2%)	0.4	0.004	2.233(1.301-3.833)
Previous history of cancer	Yes	12(34.3%)	71(28.7%)	1		
	No	23(65.7%)	176(71.3%)	1.29	0.07	0.31(0.04-

						1.16)
Do you smoke >100 cigarette in your life time	Yes	20(46.5%)	63(26.4%)	1		
	No	49(34.5%)	176(73.6%)	1.1	0.003	2.791(1.406-5.540)
have you been exposed to tobacco smoke in enclosed space	Yes	3(33.3%)	80(29.3%)	1		
	No	6(66.7%)	193(70.7%)	0.2	0.15	0.19(0.16-1.32)
do you have exposure to dust	Yes	8(26.7%)	75(29.8%)	1		
	No	22(73.3%)	177(70.2%)	0.8	0.04	0.16(0.23-3.2)

*P value less than 0.05 were significant, 1 reference group

10. Discussion

The solitary pulmonary nodule is a common radiologic abnormality that is often detected incidentally. Although most solitary pulmonary nodules have benign causes, many represent stage I lung cancers and must be distinguished from benign nodules in an expeditious and cost-effective manner[3].

According to our study the prevalence of pulmonary nodule is **29.43%**. The prevalence of pulmonary nodule is variable in studies done in different countries but this is the first study done to evaluate this topic in Ethiopia. Two hundred and forty eight patients underwent a computed tomography thorax as part of their trauma assessment 8.5%(21/248) had incidental pulmonary nodule[15]. A study conducted in Germany among children without malignant disease using multi-row CT revealed that 33% of the participants had pulmonary nodules [16]. Another Prospective cohort study conducted in north china indicated that 26.23% had pulmonary nodules[17]. In the above Chinese study tuberculosis was one of commonest causes of nodule which looks similar in our study as about 12% of our study participants have current or previously treated TB. The prevalence of pulmonary nodule in our study is more consistent with the one done in china and the reason may be increased TB prevalence.

Smoking habits seem to play a major role in this association. Studies like [10], [17], [20-23] have shown a strong connection between cigarette smoking and the presence of pulmonary nodules. This relationship highlights the importance of considering smoking history when analyzing chest imaging results.

Additionally, presence of chronic lung disease, as noted in study [17], have also been linked to the presence of pulmonary nodules. This insight emphasizes the significance of paying attention to presence of chronic lung disease when interpreting chest imaging findings.

Previous studies have yielded varying results regarding this association. Some studies have failed to demonstrate a statistically significant link between smoking history and the presence of pulmonary nodules on chest imaging[21]. These findings suggest a discrepancy in the existing literature, highlighting the need for further investigation.

Factors like age [10, 17, 20-23], female gender[24], exposure to second-hand smoke (SHS) at work [17], exposure to dust exposure [17] prior history of cancer [10, 17, 23, 25, 26], tobacco use [10, 23], and family history of cancer [17] were associated with pulmonary nodules but these factors have no significant association in our study.

11.limitations of the study

Our study is the first study done in Ethiopia and the results are relevant for the total population as well as for those who had pulmonary nodule. As a limitation this is done in tertiary hospital where patients are referred from different parts of the country with different complaints which may overestimate the prevalence. The data is collected retrospectively so that there are missing variables on the study which are difficult to obtain. Small sample size is another limitation of this study.

12.Conclusion and recommendations

Lung cancer is the number one cause of malignancy associated morbidity and mortality world wide and early diagnosis and treatment is needed for patient survival. To diagnose lung cancer early proper diagnosis and follow up of pulmonary nodule is needed and adequate data on this topic helps a lot.

The prevalence of pulmonary nodule is very high in patients who have chest CT for different reasons (29.43%). Presence of chronic lung disease and cigarette smoking are significantly associated with pulmonary nodule, so we recommend further studies to be done in this regard.

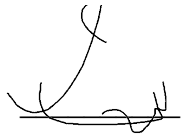
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14. Advisors' approval sheet

I the undersigned resident agree to accept all responsibilities for the scientific, ethical and technical conduct of the research project and for provision of required progress reports as per terms and conditions of the Research and Publication Directorate and /or Department of Public Health of St. Paul's Hospital Millennium Medical College.

Investigator's name	signature	Date
Dr. Kerebih Molla	_____	__/__/__
Name of the advisors		
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