Comparative study to evaluate the haemoglobin levels among cigarette smokers and non-smokers admitted to a tertiary care hospital in Belagavi

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Abstract- One of the global issues that lead to various diseases is smoking. A number of blood markers vary with smoking, and it is thought that smoking raises haemoglobin levels. The goal being to compare how smoking affects haemoglobin levels in smokers and those who do not smoke Materials and techniques: In the Haematology Laboratory of the Department of Pathology, a cross-sectional comparison research was carried out. Twenty smokers and non-smokers made up the investigation's total sample size of 70.

Index Terms- Assessment, Comparative study, Haemoglobin, Cigarette smokers, Non-smokers. (Keywords).

I. Introduction

In accordance to the (WHO), tobacco use destroyed 100 million people everywhere in the 20th century and warned that it could kill one billion people worldwide in the 21st. By the early 2030s, it is anticipated that annual fatalities attributed to tobacco will increase to around 10 million. In India, smoking is a prevalent activity observed in both urban and rural areas, irrespective of the smoking method, including cigarettes, bidis, pipes, cigars, or hookahs. Tobacco remains a major risk factor associated with various respiratory and cardiovascular diseases.

Cigarette smoking is recognized as the primary preventable cause of disease and mortality in developed countries. During the latter part of this century, the United States has experienced notable changes in smoking prevalence, characterized by a decrease among men and an increase among women. This has resulted in current smoking rates of approximately 25% of the adult population, thereby reducing the disparity in smoking prevalence and associated health issues between genders. In the United States, current smoking rates show a positive correlation with younger age, lower income levels, reduced educational achievement, and residence in underprivileged neighbourhoods.

Passive smoking, commonly referred to as secondhand smoking, involves the inhalation of tobacco smoke generated by others. Second-hand tobacco smoke arises from multiple sources, including cigarettes, pipes, cigars, and shisha pipes (hookah). The smoke is released by a person who is actively smoking, and it also comes from the burning end of a tobacco product. While most tobacco smoke is not readily visible, it disperses quickly and can remain in the air for several hours. Furthermore, it can settle on surfaces, furniture, and clothing, a situation termed third hand smoke. Passive smoking poses significant health risks and can result in many of the same health problems associated with smoking. Inhaling smoke during pregnancy can also have an impact on the developing fetus.

An increase in haemoglobin concentration is believed to be affected by exposure to carbon monoxide, with some researchers suggesting that the higher levels of haemoglobin found in the blood of smokers may act as a compensatory response. Carbon monoxide attaches to haemoglobin to form carboxyhemoglobin, which is a non-functional variant of haemoglobin that cannot transport oxygen. The formation of carboxyhemoglobin also results in a leftward shift of the Hb dissociation curve, which diminishes the haemoglobin's ability to supply oxygen to tissues. In order to counterbalance this impaired oxygen delivery, smokers generally exhibit elevated haemoglobin levels in comparison to non-smokers.

Elevated erythrocyte counts and hematocrit levels observed in male smokers can be attributed to tissue hypoxia induced by heightened carboxyhemoglobin production, which stimulates an increase in erythropoietin secretion, subsequently enhancing erythropoiesis. Additionally, carbon monoxide present in tobacco smoke contributes to increased capillary permeability, resulting in a reduction of plasma volume. This ultimately mimics the condition known as polycythaemia, characterized by a higher ratio of erythrocytes within the blood volume, which is also evident in the raised HCT values.

II. Objectives

- To evaluate the impact of cigarette smoking on hemoglobin levels in both smokers and non-smokers.
- To assess the correlation between hemoglobin levels among cigarette smokers and non-cigarette smokers, considering specific sociodemographic variables.

III. Review of literature

A comparative cross-sectional study was conducted utilizing a purposive sampling technique. A total of 40 subjects were evenly divided between smokers and non-smokers, with ages ranging from 20 to 50 years. The smokers had been consistently consuming 10 to 20 cigarettes daily for a minimum of 3 years.

A cross-sectional study was conducted in Quetta, Pakistan. In the present study, we enrolled a total of 142 healthy adult male participants, which included smokers (n=71) and non-smokers serving as controls (n=71). The smokers were defined as individuals who regularly consumed a minimum of 11 cigarettes per day for at least 3 years; otherwise, they were classified as non-smokers. In our cohort, only male participants met the inclusion criteria, while none of the females satisfied the requirement of consuming a minimum of 11 cigarettes for at least 3 years and were therefore excluded from the study.

A comparative cross-sectional study was conducted in the Department of Pathology, Haematology Laboratory, B.P. Koirala Institute of Health Sciences, situated in Dharan, Nepal. The study comprised a total sample size of 100 participants, including 50 smokers and 50 non-smokers. Hemoglobin levels were assessed using the Cyanmethemoglobin method. 't' test was applied for parametric data, whereas the Chi-Square test was used for categorical data. A p-value of less than 0.05 was considered statistically significant.

IV. Operational definitions

Assessment: Assessment pertains to the procedure utilized for determining the haemoglobin level through complete blood count parameters.

Comparative study: A comparative study is characterized as an analytical method that investigates similarities and differences across various geographic regions, frequently involving the comparison of different countries or the examination of a phenomenon across diverse contexts using a shared conceptual and analytical framework.

Haemoglobin: This is the protein found in red blood cells that is responsible for transporting oxygen to the tissues. To guarantee sufficient oxygenation of tissues, it is essential to maintain an adequate level of haemoglobin. The concentration of haemoglobin in whole blood is measured in grams per decilitre (g/dl).

Cigarette smokers: Cigarette smokers are individuals who are susceptible to the inhalation of tobacco smoke, which contains nicotine, a highly addictive compound that presents considerable health risks and contributes to various diseases.

Non-smokers: A non-smoker is defined as an individual who refrains from smoking cigarettes or any form of tobacco products..

V. Hypothesis

H_1: The impact of cigarette smoking on haemoglobin levels will be observed between smokers and non-smokers.

H_2: A significant correlation is expected between the haemoglobin levels of cigarette smokers and non-cigarette smokers, taking into account selected sociodemographic variables.

VI. Materials & Methods

This research was a comparative cross-sectional study that employed a purposive sampling technique. A total of 40 subjects were evenly distributed between smokers and non-smokers, with ages ranging from 20 to 50 years. The smokers had been consistently consuming 10 to 20 cigarettes daily for a minimum of 3 years. Blood samples were collected from each participant and analysed using the CBC method.

Research approach: The research approach adopted for this study was the cross-sectional research approach.

Research design: In the present study the researcher adopted a d cross-sectional research design.

Dependent variable: In this study, adult smokers and non-smokers.

Independent variable: In this study, the level of haemoglobin level.

Extraneous variables: It includes selected parents' demographic data, including age, education, and marital status.

Setting: The study was conducted in a respiratory ward.

Population: Adult patients in a respiratory ward.

Target population: The target population of this study is mothers of hospitalized adult patients.

Sample size: For the purpose of assessing effect of haemoglobin level among cigarette smokers and non-smokers hospitalized adult patients, 70 samples were considered from the respiratory ward.

Sample & sampling technique: Purposive sampling was used to select the sample**.**

VII. Results

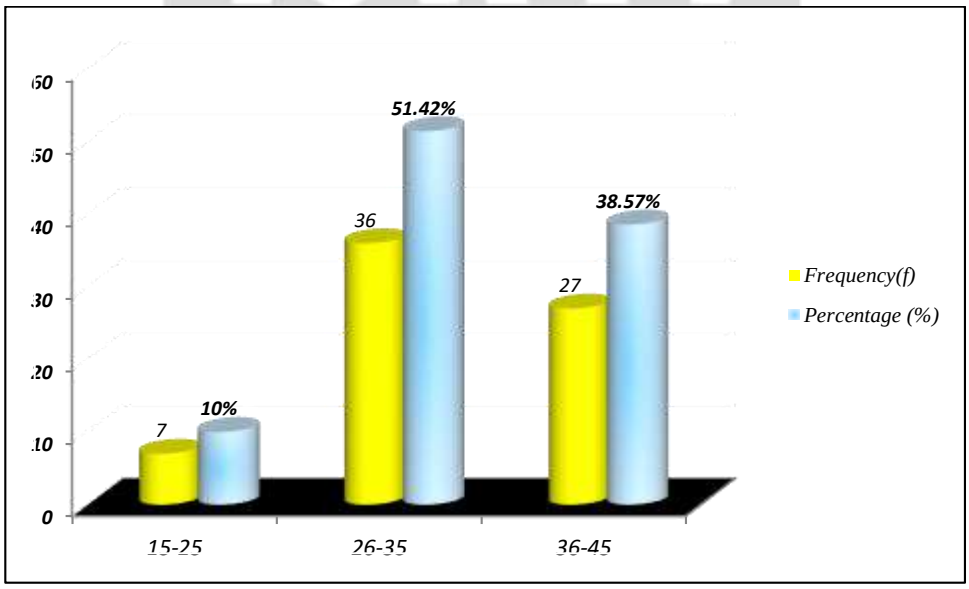
Table I: A comparison of smokers and non-smokers based on selected sociodemographic variables.

N= 70

Variables	***Smokers***		***Non-smokers***	
Age (Years)	***Frequency(f)***	***Percentage (%)***	***Frequency(f)***	***Percentage (%)***
15-25	7	10	15	21.42
26-35	36	51.42	35	50
36-45	27	38.57	20	28.57
Education				
Below 10th grade	20	28.57	16	22.85
10th geade	9	12.85	14	20
P.U.C	18	25.71	13	18.57
Graduation	23	32.85	27	38.57
Marital status				
Married	38	54.28	32	45.71
Unmarried	32	45.71	38	54.28

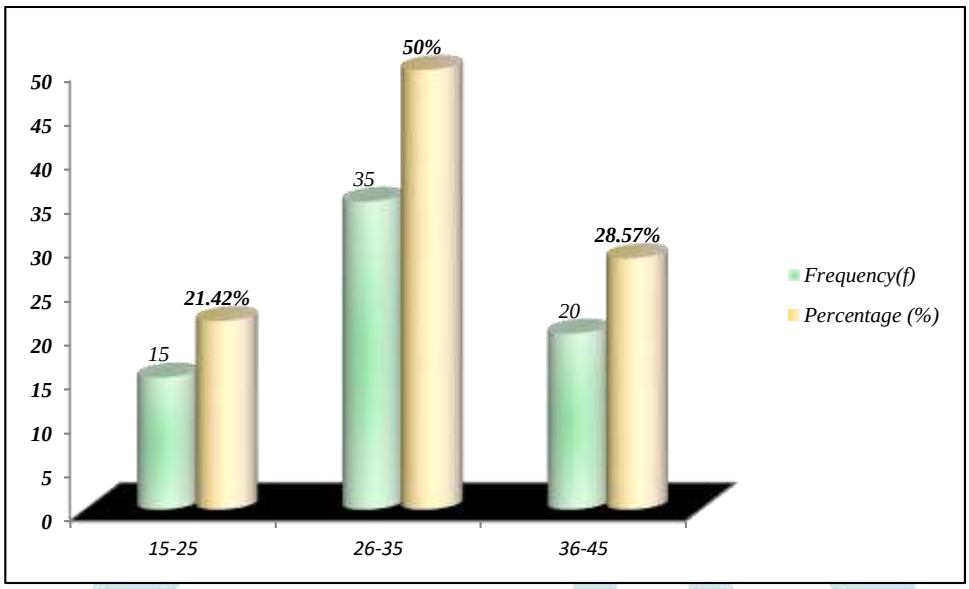
Values are expressed in frequency (f) and (%) of subjects

Graph 1: Distribution of respondents according to the age {smokers}.



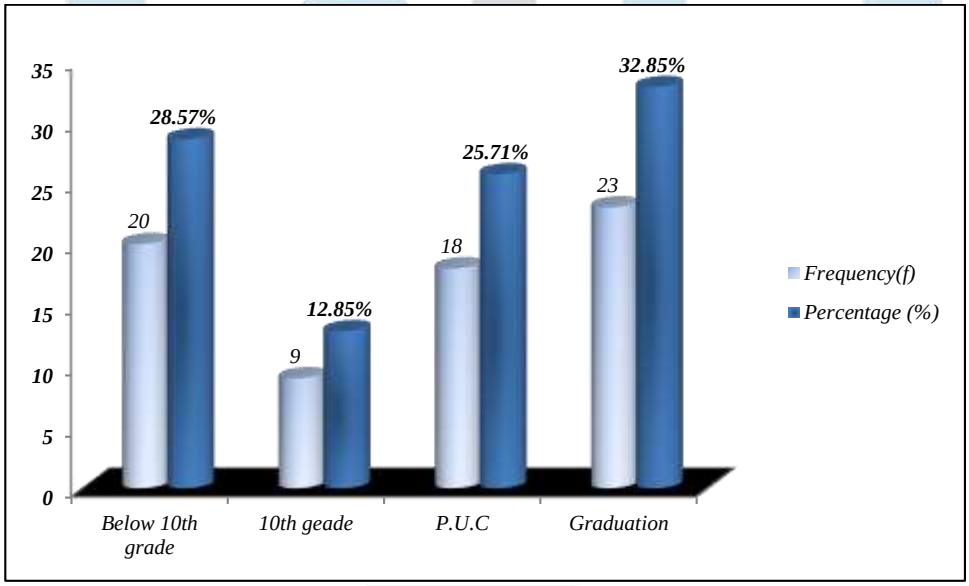
Graph 1; Shows that majority of the respondents were 36 (51.42%) belonged to 26-35 years, 27 (38.57%) belonged to 36-45 years, and 7 (10%) belonged to 15-25 years.

Graph 2: Distribution of respondents according to the age {non-smokers}.



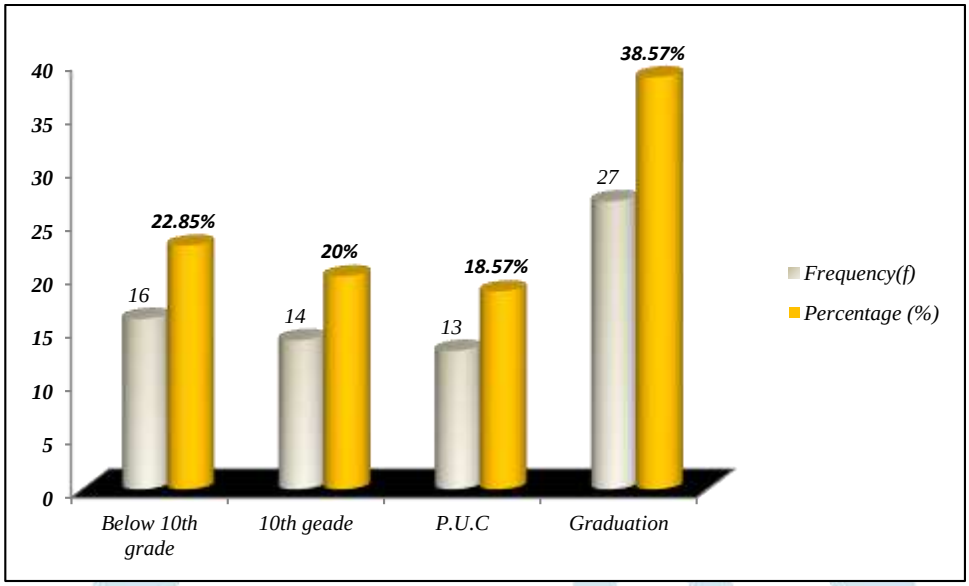
Graph 2; Shows that majority of the respondents were 35 (50%) belonged to 26-35 years, 28 (8.75%) belonged to 36-45 years, and 15 (21.42%) belonged to 15-25 years.

Graph 3: Distribution of respondents according to the education {smokers}.



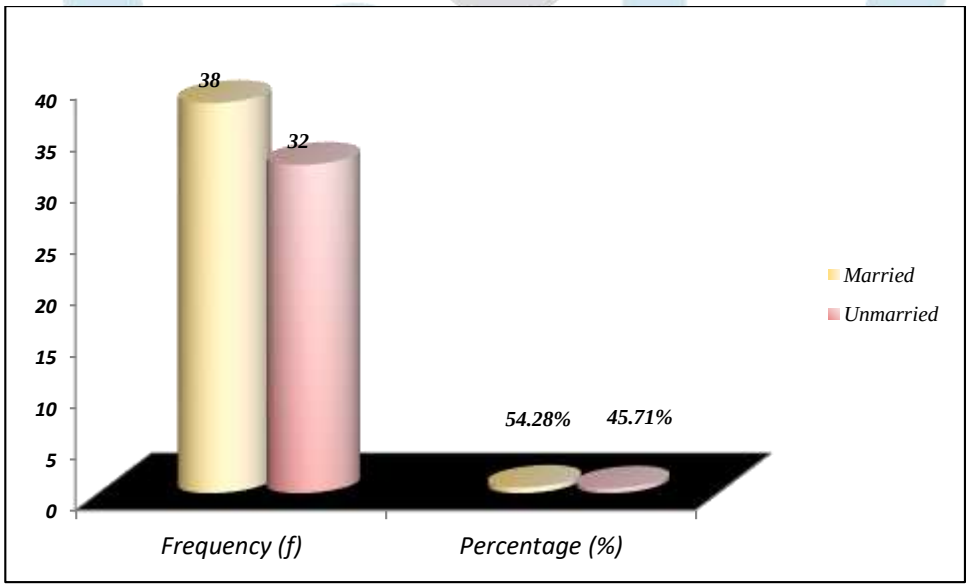
Graph 3: Shows that majority of the respondents were 23 (32.85%) belonged to graduation, 20 (28.57%) belonged to below 10th grade, 18 (25.71%) belonged to P.U.C and 9 (12.85%) belonged to 10th grade.

Graph 4: Distribution of respondents according to the education {non-smokers}.



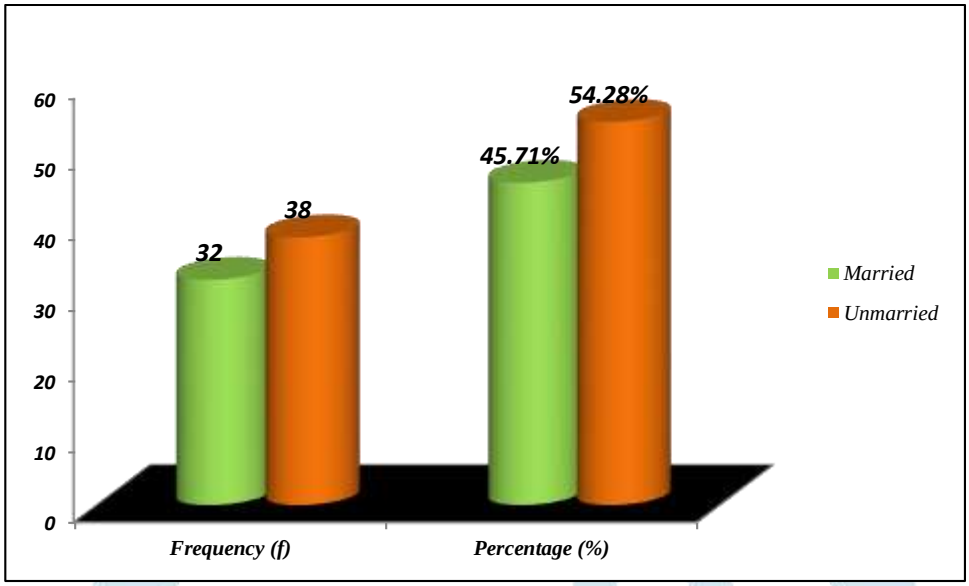
Graph 4: Shows that majority of the respondents were 27 (38.57%) belonged to graduation, 16 (22.85%) belonged to below 10th grade, 14 (20%) belonged to P.U.C and 13 (18.57%) belonged to P.U.C.

Graph 5: Distribution of respondents according to the marital status {smokers}.



Graph5: Shows that majority of the respondents were 38 (54.28%) belonged to married and 32 (45.71%) belonged to unmarried.

Graph 6: Distribution of respondents according to the marital status {non-smokers}.



Graph 6: Shows that majority of the respondents were 38 (54.28%) belonged to unmarried and 32 (45.71%) belonged to married.

Table II: Haematological results revealing that WBC, RBC, Hb, HCT, MCHC, and PCT, are significantly different in smokers than compared to non-smokers.

N=70

Parameters	*Smokers*		*Non-smokers*		*p- value*
	Mean	*SD*	*Mean*	*SD*	
WBC ($(10^3/\mu l)$	7.6	2.2	6.9	1.5	0.027*
RBC ($10^3/\mu l$)	5.3	0.8	5	0.59	0.011*
Hb (g/dl)	16.1	2.4	14.7	1.43	0.001*
HCT	49.6	11.5	45.3	5.7	0.006*
MCV(fl)	90.2	14.2	88.6	8.6	0.404
MCH (pg)	28.1	4.1	28.8	2.9	0.283
MCHC (g/dl)	31.5	2.5	32.5	2.18	0.009*
RDW (%)	13.2	1.7	12.8	0.11	0.102
PLT ($10^3/\mu l$)	252.2	71.5	270.2	60.25	0.107
PCT (%)	0.12	0.036	0.13	0.03	0.017*
MPV (fl)	5.2	1.16	5.28	0.95	0.905
PDW (%)	17.2	1	17.3	0.94	0.662

* Statistically significant

VIII. Abbreviation used

White Blood cells (WBC), Red Blood cells (RBC), Haemoglobin), Haematocrit (HCT), Mean Corpuscular Volume (MCV), Mean Corpuscular Haemoglobin (MCH), Mean Corpuscular Haemoglobin Concentration (MCHC), Red Cell Distribution Width (RDW), Platelets (PLT), Platelet count (PCT), Mean Platelet Volume (MPV), and Platelet Distribution Width (PDW).

IX. Statistical analysis

Data analysis was conducted utilizing the Sigma state statistical software version 3.5. The haematological values of smokers and non-smokers were compared through the application of an unpaired "t" test. P-value of less than 0.05 was deemed statistically significant.

X. Discussion

Smoking poses significant health risks; this is a well-known fact. Nevertheless, many individuals do not fully comprehend the profound effects of smoking, which not only jeopardizes the smoker's health but also endangers the well-being of those around them. There is a general lack of awareness regarding the various health issues that smoking can cause, not only for active smokers but also for those who are exposed to secondhand smoke. Therefore, before you light another cigarette, it is essential to understand the consequences of smoking. Smoking is a key factor that elevates haemoglobin concentration, a process believed to be influenced by carbon monoxide exposure. Carbon monoxide attaches to haemoglobin, resulting in the formation of carboxyhemoglobin, an inactive variant of haemoglobin that lacks the capacity to transport oxygen. Additionally, carboxyhemoglobin causes a leftward shift in the haemoglobin dissociation curve, which diminishes the ability of haemoglobin to supply oxygen to tissues.

XI. Conclusion

Findings of the current study indicate that the haemoglobin levels are considerably elevated in smokers compared to non-smokers. Additionally, further extensive research involving various age demographics is necessary to validate these results. Furthermore, a widespread campaign should be initiated by the government, media, and other organizations to raise awareness about the detrimental effects of cigarette smoking.

XII. Acknowledgement

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