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Research Article

Evaluation of lipid profile and hematological parameters among patients attending Ram Janaki Hospital, Janakpurdham

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ABSTRACT

Background & Objectives: Hematological and lipid profiles play crucial roles in assessing health conditions and monitoring physiological abnormalities. Hematological and lipid profiles serve as valuable tools in this context, providing insights into various health conditions. However, due to various factors like diet, socioeconomic status, and literacy, these profiles can differ significantly across populations. Therefore, we aimed to find out the hematological as well as biochemical parameters among the patients attending Ram Janaki Hospital, Janakpurdham.

Materials and Methods: This hospital-based study involved 140 patients attending the medicine OPD between September 2023 and February 2024. Anthropometric measurements, blood pressure, and BMI was calculated. Venous blood samples were collected. Hematological parameters were assessed using a fully automated hematology analyzer, while lipid profiles were evaluated using semi-analyzer Erba Chem-7 analyzer with Erba Diagnostics kits. Data analysis was performed using SPSS version 21.

Results: The study population comprised an equal distribution of males and females. Males exhibited higher values in weight, height, BMI, and blood pressure as compared to females. Hematological analysis revealed higher hemoglobin levels, red blood cell counts, and packed cell volume in males, while females showed higher total leukocyte counts. Lipid profile analysis indicated higher total cholesterol and LDL levels in males, whereas females had higher HDL, triglyceride, and VLDL levels.

Conclusion: The finding highlights significant gender-based differences in anthropometric, hematological, and biochemical parameters among patients in Janakpurdham. The findings emphasize the importance of considering gender differences in clinical evaluations and treatment plans. The observed variations from international norms underscore the need for population-specific reference ranges.

Keywords: Anthropometric measurements, blood pressure, cardiovascular risk factors, cholesterol, hematological profile

INTRODUCTION

In this modern world, due to fast life and sedentary lifestyle individuals are at increased risk of diabetes, cancer, mental health issues, chronic heart disease, and various hormone imbalances[1]. Regular checkup is equally important to diagnose the early stage of any disease and prevent its future complications. Hematological profiles help in the detection and monitoring of many diseases by providing vital information about blood components. Early intervention is made possible by their ability to identify conditions like anemia and abnormalities in white blood cell counts [2]. Lipid profiles are equally important because they can be used as biomarkers for a variety of illnesses. They play a crucial role in determining the risks associated with heart health and the rate at which pre-diabetes turns into diabetes [3]. It is also useful in identifying people who are at a higher risk of experiencing cardiac event which is done conjunction with troponin tests to facilitate early detection [4].

The values for lipoprotein in a population varies because of distinct variations in socioeconomic and geographic conditions, race, dietary habits, age, and sex which affect the relevance of values found in one population to another [5]. The plasma lipid values of distinct populations exhibit distinct cut-off values, which are ascribed to various factors such as genetic predisposition, diet, and socioeconomic status. A study carried out in Nepal to establish reference values for LDL-C, HDL-C, triglycerides, and total cholesterol found that the Nepalese population fell into certain ranges for each of these parameters: LDL-C (1.05–4.00 mmol/L), triglycerides (0.42–3.32 mmol/L), total cholesterol (2.53–6.14 mmol/L), and HDL-C (0.28–1.46 mmol/L) [6].

Previous studies also demonstrated the importance of such assessments and showed regional variations in blood parameters in Western Uttar Pradesh [7] and higher prevalence of dyslipidemia in Jaipur's urban population [8]. However, The Indian Council of Medical Research–India Diabetes (ICMR-INDIAB) study provided comprehensive data on diabetes and associated biochemical parameters across several Indian states, underscoring the value of region-specific health assessments [9]. Globally, the National Health and Nutrition Examination Survey (NHANES) in the United States serves as a model for population-based health studies [10].

Although, several studies collectively demonstrate the significance of population-specific health profiling and its potential impact on public health strategies, but the relevant data on hematological and biochemical profile seems to be scanty in Janakpurdham, Madhesh Province. Evaluating hematological and lipid profiles in specific populations could be crucial for understanding regional health status and guiding public health interventions. Therefore, the objective of this study was

undertaken to evaluate hematological and lipid profiles among patients attending Ram Janaki Hospital, Janakpurdham.

MATERIALS AND METHODS

The study was a hospital-based study conducted on patients attending medicine OPD at Ram Janaki Hospital, Janakpurdham between September 2023 to February 2024. Among total of 200 patients visiting medicine OPD, 140 patients were investigated through laboratory investigations done at clinical pathology department of the hospital. A structured questionnaire was prepared for collection of data and history of patients. Anthropometric measurements were taken. A stadiometer was used to measure height in centimeters and a digital scale to measure weight in kilograms. After giving participants five minutes to rest, blood pressure (mm/Hg), both diastolic and systolic, was measured using a sphygmomanometer. BMI was calculated by using the standard formula weight in kilograms (kg) divided by height in meters (m) squared. Standard operating procedures were followed for estimating different blood parameters. Venous blood samples were collected to assess hematological parameters such as hemoglobin, red blood cell count, white blood cell count, and platelet count. Biochemical profiles included measurements of majorly lipid profile viz. total cholesterol, high-density lipoprotein (HDL) cholesterol, low-density lipoprotein (LDL) cholesterol, and triglycerides. To avoid cellular alterations, venous blood samples were collected with sterile needles and syringes and kept between 2-8°C under aseptic conditions. A fully automated hematology analyzer was used to measure hematological parameters and semi-analyzer Erba Chem-7 analyzer with Erba Diagnostics kits was used to evaluate the lipid profile of the blood. All instruments were calibrated on a regular basis, and quality control procedures were followed to ensure the accuracy and consistency of the measurements. The data was entered to SPSS version 21 statistical package for analysis. Descriptive statistics were used to summarize the frequency distributions. The work approval letter was obtained from Ram Janaki Hospital, Janakpurdham (Ref: 055/080/081).

RESULTS

Out of total 200 study patients, an equal distribution of males and females each comprising of 50% participated in the study. The age distribution revealed a majority of patients (70%) were in the 40-59 age group. Regarding educational status, majority of the patients were illiterate (52.5%). Employment status showed that 63.5% of them were employed and 83.5% of the patient were married as shown in table 1.

Table-1 Socio-demographic characteristics

Demographic Variables		Number (%)
Gender	Male	100(50)
	Female	100(50)
Age Group	20-39	40(20)
	40-59	140(70)
	60 and above	20(10)
Education	Literate	95(47.5)
	Illiterate	105(52.5)
Employment	Employed	127(63.5)
	Unemployed	73(36.5)
Marital Status	Married	167(83.5)
	Unmarried	30(15)
	Widow	3(1.5)

Table 2 depicts the anthropometric measurements of patients. The weight and height of males were greater than that of females with values ranging from 60.45±9.19

Table-2: Anthropometric and BP measurements (n=200, Mean±SD)

Parameter	Male(n=100)	Female(n=100)
Weight (Kg)	60.45±09.19	49.02±08.56
Height (Cm)	170.23±6.12	152.32±4.38
Blood pressure (mm/Hg) (Systolic)	130.55±10.24	110.23±13.25
Blood pressure (mm/Hg) (Diastolic)	82.1±8.22	75.08±9.26
Body mass index (BMI)	24.32±3.2	20.67±4.32

Table-3: Hematological parameters (n=140, Mean±SD)

Parameters	Male	Female
Hemoglobin(gm/dl)	14.0 ± 3	10.6 ± 0.9
TLC (per/cumm)	8258.32±2356	9234.0± 2347
Segmented Neutrophils (%)	61.5±12	64.3±11.2
Lymphocytes (%)	29.2±8.2	28.23±10.0
Eosinophil (%)	2.36±1.2	3.42±1.52
Monocytes (%)	0.42±0.2	0.6±0.3
Basophiles (%)	0 ± 0	0 ± 0
Total RBC Count (million/cumm)	4.70±0.65	3.36±0.52
PCV (%)	43.2±10.2	32.2±4.32
MCV (fl)	83.5±10.5	82.1±9.32
MCH (pg)	27.09±10.23	25.3±3.6
MCHC (g/dl)	31.40±4.2	35.51±3.2
Platelet count (lacs/cumm)	4.32±2.13	3.10±1.80

(TLC: Total Leukocyte Count; RBC: Red Blood Cell; PCV: Packed Cell Volume; MCV: Mean Corpuscular Volume; MCH: Mean Corpuscular Hemoglobin; MCHC: Mean corpuscular Hemoglobin Concentration)

kg and 170.23±6.12 cm, respectively. Also, the BMI of male population was 24.32±3.2 which was greater than females. Also, both systolic (130.55±10.24 mmHg) and diastolic (82.1±8.22 mmHg) were found to be higher in males as compared to females.

Table 3 depicts blood investigations were followed among 140 individuals, comprising both males and females. Hemoglobin levels were found to be 14.0±3 gm/dl in males as compared to females. Additionally, compared to females, males showed a greater packed cell volume (43.2±10.2 percent) and total red blood cell count (4.70±0.65 million/cumm). However, the total leukocyte count for females (9234.0±2347 per/cumm) was higher than that of males. The MCHC was also higher in female population with 35.51±3.2 g/dl. The MCV, MCH, for males was found to be 83.5±10.5 fl and 25.3±3.6 pg, respectively which was higher than female population.

Table 4 demonstrates males had a higher total cholesterol level (185.26±36.32 mg/dl) in the lipid profile than females. Compared to men, women had a greater level of HDL cholesterol (43.27±9.46 mg/dl). The triglyceride level was higher in females (132±24.31 mg/dl) than in males. The LDL cholesterol level was greater in men (125±31±46 mg/dl) than in women. The VLDL levels were greater in females, at 21.00±4.86 mg/dl.

Table-4: Lipid Profiles (n=140, Mean±SD)

Parameters (mg/dl)	Male	Female
Total Cholesterol	185.26 ± 36.32	174.32 ±26.32
HDL Cholesterol	39.84 ± 7.39	43.27 ± 9.46
Triglyceride	102 ± 26.27	132 ± 24.31
LDL	125.6 ±31.46	110 ± 32.24
VLDL	20.4 ± 5.25	21.00 ± 4.86

(HDL: High Density Lipoprotein; LDL: Low Density Lipoprotein; VLDL: Very Low Density Lipoprotein)

DISCUSSION

An equal number of male and female patients (50%) participated in our study for anthropometric measurements. Gender plays significant role in disease, influencing the hematological and biochemical profiles of patients in various health conditions. For instance, in patients with Cushing's disease, males presented with higher ACTH, BMI, HbA1c, systolic blood pressure, and hemoglobin levels, along with an elevated incidence of fatty liver and hepatic function abnormalities compared to females [11].

Patient's age varied widely, with the majority falling into the 40–59 age range. This suggests that this demographic should receive special attention because individuals in this age range are typically at a turning point in the development of a number of health-related issues. Studies have shown that age-related hematologic alterations include an increased risk of myeloproliferative disorders, anemia, and deteriorating adaptive immunity, with a loss in bone marrow cellularity observed in geriatric patients [2]. Moreover, pregnant women aged 18 to 48 years with anemia displayed lower levels of hematological parameters like hemoglobin, hematocrit, and mean corpuscular volume, along with decreased serum ferritin and iron levels [12]. Educational status showed that 52.5% patients were illiterate. Educational status are often associated with health awareness and the ability to engage in health-promoting behaviors which becomes crucial in understanding and managing patients' hematological and biochemical profiles. Research has shown that patients with lower health literacy levels may face challenges in recognizing early signs of diseases like dengue, where clues such as haemoconcentration, leucopenia, thrombocytopenia, lymphocytosis and altered liver enzymes can indicate the need for serological testing [13].

The differences between males and females that was observed in the study aligns well with established physiological trends. According to average BMI, height, and weight, males were higher than females, which is consistent with the widespread sexual dimorphism observed in human populations [14]. The average BMI of females (20.67±4.32) is at the lower end of the normal range according to WHO guidelines, while the average BMI of males (24.32±3.2) is higher than that of females and falls within the normal range [15]. This difference may be

because of male population having higher proportion of muscle mass [16]. Men had higher blood pressure(both systolic and diastolic), which is consistent with recent large-scale studies referencing an international analysis carried out by the NCD Risk Factor Collaboration (2021) that showed similar gender-based variations in blood pressure among various populations [17]. These gender-based distinctness have major impact on assessing and managing health related risk factors of diseases. Male population having higher blood pressure are indicative of them approaching to hypertension threshold, which is suggestive that this group is more susceptible to cardiovascular disease [18].

Male had higher hemoglobin levels, PCV, and RBC counts which is consistent with well-established sex-based variations in parameters related to red blood cells. This finding is supported by a large-scale study involving 25,000 individuals [19]. However, females had a higher total leukocyte count although most studies have found males having comparable or slightly higher counts [20]. This could be because of increased neutrophils in female which again could be due to several factors and a similar study comprising of 12,000 participants showed increased TLC [21]. Males having higher MCV and MCH are within the usual reference ranges for both sexes, despite being statistically significant [22]. The findings that males had slightly higher MCV and MCH is comparably supported by a thorough study on hematological reference intervals across various age groups and sexes [23]. The MCHC was notably higher in the population of females which is in proximity that MCHC usually varies little between the sexes or even between populations [24]. In the line with our findings, small differences in MCHC between the sexes were discovered in a Malaysian population study, though, indicating that these parameters might be influenced by population-specific factors [25].

These sex-specific hematological variations have substantial therapeutic implications in two areas: interpreting full blood counts and diagnosing and treating different hematological illnesses. The MCHC difference and the higher leukocyte count in females in our study emphasizes the importance of creating population-specific reference ranges and taking individual variability into account in clinical practice as reported in previous studies [26]. Furthermore, research should be focused on exploring the underlying processes of these observed differences, particularly those that deviate from standard practices, and exploring any potential medical consequences. Longitudinal study may provide a better understanding of how these factors change over time and with age in different groups [27].

The lipid profile analysis showed significant gender disparities which gives a complex picture of cardiovascular risk factor that both follows and deviates from some well-established trends in the literature. Our results revealed that males had higher total cholesterol levels than those found in a study done in the Nepalese population, with the reference interval being (2.52-6.43) mmol/L or (45.40-115.86) mg/dl [6]. This might be due to age-related changes in total cholesterol levels which is increased more in men compared to women [28].

Females have higher HDL cholesterol levels, which is consistent with established fact that the effects of estrogen, which increase HDL production and decrease hepatic lipase activity, are thought to be responsible for this

sex-based difference [29]. There may be a cardiovascular benefit for females in this population if they have higher HDL levels, which are typically linked to a protective effect against cardiovascular disease [30]. Contrary to many population studies that typically report higher triglyceride levels in males [31], but in our study females showed higher triglyceride levels. Recent studies have revealed that this pattern can change based on a number of variables, including age, menopausal status, and lifestyle choices [32].

Since elevated triglycerides are a separate risk factor for cardiovascular disease, the higher triglyceride levels in females merit further research. Males had greater LDL cholesterol levels, which is in line with broad patterns seen in a variety of demographics. The main goal of reducing cardiovascular risk is LDL cholesterol, and males' elevated levels of this lipid may indicate a higher risk of atherosclerosis [33]. However, women had higher VLDL levels than men. The higher triglyceride levels seen among females could be possibly related that VLDL levels are closely linked to triglyceride metabolism. In the context of insulin resistance and metabolic syndrome, in particular, recent studies have emphasized the significance of VLDL in the assessment of cardiovascular risk [34]. These gender disparities in lipid profiles have important ramifications for managing and accessing cardiovascular risk. Males appear to have a higher overall atherogenic risk profile due to their higher LDL and total cholesterol levels. However, females may have some protective effects from their higher HDL levels, which could balance out the risks related to their elevated VLDL and triglyceride levels. In order to comprehend how these lipid profiles change with age and are impacted by hormonal shifts, especially in women going through menopause, future research should concentrate on longitudinal studies. Furthermore, examining the correlation between these lipid parameters and clinical outcomes would yield significant knowledge regarding the stratification of cardiovascular risk according to sex. This study was limited to the relatively small sample size, which may not adequately represent all the patients of Janakpurdham. A larger sample size would provide more reliable data and allow for the establishment of more precise reference ranges for hematological and lipid profiles.

CONCLUSION

This study reveals significant gender-based differences in anthropometric, hematological, and lipid profiles among the patients attending Ram Janaki Hospital, Janakpurdham. Males exhibited higher values in weight, height, BMI, blood pressure, hemoglobin levels, RBC counts, and PCV along with higher total cholesterol and LDL cholesterol levels whereas female patients showed higher TLC, MCHC, HDL cholesterol, triglycerides, and VLDL levels. Thus, it is crucial to take gender differences into account when developing clinical evaluations and treatment plans. The significance of health literacy in controlling and evaluating health indicators should be underlined, especially considering a substantial proportion of illiterate patients.

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