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Original Research Article

Prevalence of splenomegaly and factors contributing to splenomegaly among pancytopenia patients: a facility-based cross-sectional study

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ABSTRACT

Background: The spleen is an organ that cannot be clinically felt in a normal individual. Splenomegaly is a significant diagnostic indicator of the presence of underlying pathology. It is associated with a number of diseases like hematological, infectious, portal hypertension and immunological problems. However, it's unclear what exactly causes hypersplenism. The objective was to assess the prevalence of splenomegaly in people with pancytopenia and the contributing factors.
Methods: A cross-sectional study was conducted among adult patients diagnosed with pancytopenia in a tertiary care hospital in Bengaluru, Karnataka. We have considered only inpatients who accessed care at the facility over a period of 12 months from Aug 2021 to July 2022 among those who have given written informed consent. Socio-demographic details, smoking status, alcohol consumption history, existing comorbidities, and other biological parameters were assessed by accessing the medical records. The abdominal ultrasound of the admitted patients was used to diagnose splenomegaly.
Results: Splenomegaly was present in 25 (56.8%) of patients out of 44 we enrolled. Among those patients, 17 (38.6%) had mild, while 4 (9.1%) had moderate and massive splenomegaly respectively. The majority were females (28 versus 16 males) and the mean age was 44.84 years (±15.45 SD). The age ranges from 24-80 years. We observed that patients aged 36-50 years and comorbidities like hypertension and hypothyroidism were the associated factors for splenomegaly.
Conclusions: The prevalence of splenomegaly among pancytopenia patients is high. This is a significant clinical indication that requires careful investigation. Ageing, hypertension, and hypothyroidism are contributory factors for splenomegaly in patients with pancytopenia.

Keywords: Hematology, Pancytopenia, Splenomegaly

INTRODUCTION

Pancytopenia is a condition with decreased levels of red cells, white blood cells, and platelets. It is important to note that the condition is not a disease but rather a common pathway carried on by a wide range of diverse etiologies, including those that are infectious, autoimmune, genetic, nutritional, and/or malignant. Some of its distinguishing characteristics include haemoglobin levels that are less than 12 gm/dl in women and 13 gm/dl in men, platelet counts that are less than 150,000 per µl, and leukocyte counts that are less than 4000 per ml (or absolute neutrophil count of less than 1800 per ml).[1,2] It is a significant hematologic condition that frequently arises in medical care.[3] The severity and underlying etiology of pancytopenia affect its management and prognosis.[4]

Patients with spleen enlargement may experience pancytopenia. This is due to haemodilution driven by the increased plasma volume and the massive number of red cells that are pooled and destroyed in the reticuloendothelial system of the spleen. Generalised

weakness, fever, and bleeding manifestations are one of the common symptoms of splenomegaly.[5] Despite the lack of research on splenomegaly, two studies have indicated that parasite infections, connective tissue abnormalities, viral infections, and bacterial infections are the most common infectious causes of massive splenomegaly. Additional reasons include myelofibrosis, lymphoproliferative disorders, spleen cysts, and congestive splenomegaly.[6]

The spleen has a major impact on immunosurveillance and haematopoiesis. Splenomegaly is associated with a wide range of illnesses, such as haematological, infectious, portal hypertension, immunological issues, etc. Splenomegaly is a crucial diagnostic marker of the existence of underlying illness. What specifically causes splenomegaly is unknown. Splenomegaly can result in a number of very common and possibly significant side effects, including splenic sequestration crisis, spleen rupture, hypersplenism, and splenic abscesses. The goal in this study was to determine the prevalence of splenomegaly and investigate the related factors in individuals with pancytopenia.

METHODS

For this prospective cross-sectional study, the source population consisted of subjects with pancytopenia admitted at our tertiary care hospital Bengaluru. This tertiary medical centre has a unit which includes doctors, assisted by a team of nurses and all of whom are committed to putting their effort towards service of patients. We have recruited 44 inpatients who accessed care at the facility over a period of 12 months from August 2021 to July 2022, from, department of general medicine, Kempegowda institute of medical sciences, Bengaluru.

Selection criteria

We included in our study all patients suffering from pancytopenia, aged 18 years and above, having haemoglobin <10 gm/dl, total leukocyte count of <4000 cells/mm^3 with platelet count of less than 1.5 lakhs/mm^3 at admission. We have also included those patients who have not received blood or platelet transfusion in last four months from the date of enrolment.

The study has excluded those patients aged less than 18 years, patients who have received chemotherapy for neoplasms and patients with known bleeding disorders. The study also excluded pregnant and lactating women. All subjects who did not sign the informed consent form were excluded from the study. We conducted an analytical cross-sectional study by referring their previous and current medical records. We conducted purposive sampling by including those subjects who were received inpatient care at the designated tertiary care hospital. The study was able to reach the sample size of 44.

Data collection procedure

The investigator introduced himself to the patients, explained to them the study that we were conducting and invited them to authorize them to take part. Once the informed consent form had been read and signed, we proceeded to the clinical examination of the patient with pancytopenia. We consulted the medical files of the patients in search of additional information. The ultrasound of abdomen and pelvis reports of the patients were obtained to confirm the spleen size. All our data was collected using pre-tested data sheets.

Splenomegaly was defined by ultrasound as a spleen size (length) with more than 11 cm in this study which was based on the study done by Hosey et al and Jitendra et al.[7,8] It is further classified into mild where spleen size is 12-15 cm, moderate where spleen size is 15-18 cm and more than 18 cm as massive splenomegaly.

The details of socio-demographic details like age, occupation, sex, diet type, smoking status and alcohol consumption among the patients were recorded. Information on the existing comorbidities like diabetes mellitus, systemic hypertension, thyroid related problems, liver disease, kidney disease, and information on other biological parameters like vitamin B_{12} were obtained by accessing the medical records.

Statistical analysis

The data was recorded on anonymous collection sheets (to ensure the confidentiality of the results). The data was entered in Excel and statistical analyses were carried out with SPSS 16 version (statistical package for social sciences). The completed questionnaires were well checked before the data was entered manually by us. A second check was done by an independent individual to avoid any error. The results were presented as tables, figures and expressed as a percentage or in numbers.

Ethical considerations

Before starting the recruitment of patients the investigator has obtained the ethical approval from the institutional ethics committee formed at the tertiary care hospital. The investigator has obtained written informed consent before enrolling them into the study.

RESULTS

The objective was to assess the prevalence of splenomegaly in people with pancytopenia and the contributing factors.

The study included 44 diagnosed patients of pancytopenia in tertiary care hospital in Bengaluru. We have observed 56.8% of them had splenomegaly whereas only 43.2% of the patient's spleen size were normal in size. Among those with splenomegaly patients (25 out of

44) we have found that 17 (38.6%) had mild, 4 (9.1%) has moderate and massive splenomegaly respectively.

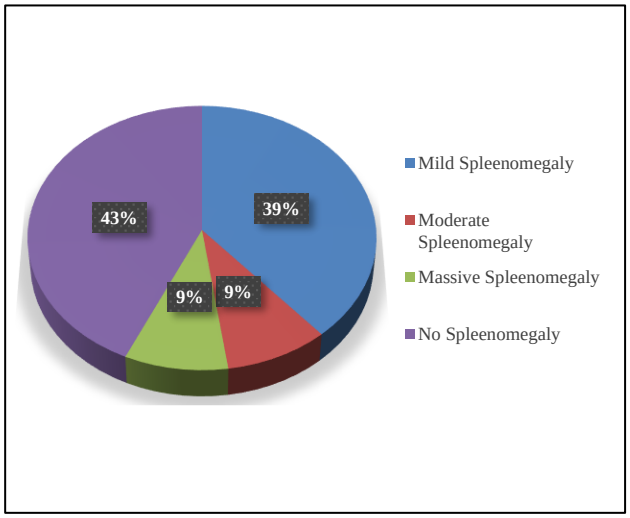

Figure 1: Prevalence of splenomegaly in patients with pancytopenia.

The majority of the patients are aged between 36 to 50 years (45.5%) followed by those who aged 51 years and above (29.5%). Among the included patients majority were females (63.6%) and higher proportion of them were following mixed diet. Among the patients recruited, 13.6% were current smokers and 29.5% consumed alcohol. The patients were also having existing co morbidities. Among those who included, there were 9% of them had history of hypothyroidism, 2.3% were suffering from chronic kidney disease. There were 27.3% of the patients were suffering from chronic liver disease, 11.4% of them were hypertensive and around 13.6% had diabetes mellitus.

Table 1: Sociodemographic characteristics of the pancytopenia patients in tertiary care hospital Bengaluru.

Variables	Category	Frequency	Percent
Age (years)	24-35	11	25
	36-50	20	45.5
	≥51	13	29.5
Sex	Male	16	36.4
	Female	28	63.6
Diet	Vegetarian	10	22.7
	Mixed diet	34	77.3
Smokers	No	38	86.4
	Yes	6	13.6
Alcohol consumption	No	31	70.5
	Yes	13	29.5
Comorbidity history			
Hypothyroidism	No	40	90.9
	Yes	4	9.1
Chronic kidney disease	No	43	97.7
	Yes	1	2.3
Chronic liver disease	No	32	72.7
	Yes	12	27.3
Systemic hypertension	No	39	88.6
	Yes	5	11.4
Diabetes mellitus	No	38	86.4
	Yes	6	13.6

Table 2: Ordinal regression analysis showing the factors associated with splenomegaly in pancytopenia patients.

Variables	Categories	Effect size/B estimate	95% CI		Sig.
			Lower	Upper	
Spleen size	Normal spleen	2.901	-0.259	6.061	0.072
	Mild	4.656	1.33	7.983	0.006
	Moderate	5.018	1.648	8.387	0.004
Vit B_{12}	High	-0.158	-1.541	1.224	0.822
	Low	-0.668	-1.946	0.61	0.305
	Normal V	Reference			
Age in years	≥51	1.143	-0.063	2.35	0.063
	36-50	1.816	0.568	3.065	0.004
	24-35	Reference			
Sex	Male	-0.624	-1.705	0.457	0.258
	Female	Reference			
Alcohol status	Yes	1.298	-0.307	2.903	0.113
	No	Reference			
Smoking status	Yes	-1.118	-2.578	0.342	0.134
	No	Reference			
Diabetes	Yes	-0.643	-2.578	1.293	0.515
	No	Reference			
Hypertensive	Yes	2.025	0.33	3.72	0.019
	No	Reference			

Continued.

Variables	Categories	Effect size/B estimate	95% CI		Sig.
			Lower	Upper	
Chronic liver disease	Yes	-0.648	-1.909	0.613	0.314
	No	Reference			
Hypothyroidism	Yes	2.27	0.095	4.446	0.041
	No	Reference			

In order to achieve the study objective, the moderate spleen sizes were merged together with massive splenomegaly and proceeded for ordinal regression. The outcome variable was spleen size with normal, mild and moderate splenomegaly categorization. The independent variables considered in the analysis were socio demographic factors like age of the patients, sex, current smoking and alcoholic status and type of diet. There were clinical morbidity factors which were considered in the analysis were Vitamin B_{12} level, history of diabetes mellitus, systemic hypertension, hypothyroidism, chronic liver disease, chronic kidney disease etc. We have included factors like, vitamin B_{12} level, age, sex, smoking and alcoholic status, and current existing morbidities and its association with the splenomegaly. Through multivariate ordinal regression analysis, we observed that age ranging from 36-50 years, history of hypertension and hypothyroidism were significantly associated with the change in spleen size among the pancytopenia patients. The details were presented in Table 2.

DISCUSSION

More than half of the patients we recruited were diagnosed of having splenomegaly, with majority of having mild splenomegaly. The majority were females (28 versus 16 males) and the mean age was 44.84 years (±15.45 SD). The age ranges from 24-80 years. The factors associated with splenomegaly among our study subjects were patients with age between 36-50 years, remove underscore and comorbidities like systemic hypertension and hypothyroidism

The study done in India among adult patients with sickle cell anemia was found the higher prevalence of splenomegaly (77.4%) than our study findings.[8] The prevalence of splenomegaly was found to be higher than our reported prevalence in the study findings from Australia. A prospective cohort study done among the HIV infected adults has showed that prevalence of splenomegaly was found to be 66% by ultrasound abdomen.[9]

There are studies revealed similar prevalence of splenomegaly. The retrospective institutional based study done among all patients in California had revealed 57% of prevalence of splenomegaly and them more than 80% reported of having massive splenomegaly.[10]

The findings which were found lower than our study findings were from Cameroon, where the analytical cross sectional study done among children has shown that out of 403 children with sickle cell anemia assessed for splenomegaly has reported prevalence of 35%.[11]

The risk factors associated with splenomegaly has been reported as acute or chronic leukemia, infections like tuberculosis, malaria and endocarditis, hepatic and heart related diseases were found to be significantly associated with splenomegaly in California's retrospective study findings.[10] The study done in Australia among HIV patients has shown that existing liver disease is associated with splenomegaly.[9] The same study found no association with age and CD_4 count with splenomegaly status of the patients.[9] The risk factors found associated with splenomegaly found in patients with sickle cell anemia are malaria, hepatomegaly, platelet count, intake of non-steroidal anti-inflammatory drugs, fraction of hemoglobin F and S.[11]

The study population only included the admitted patients of pancytopenia and was able to enroll only less number of pancytopenia patients. These are the limitation of our study.

The chance that splenomegaly in non-Hodgkin's lymphoma is a serious concern when it is found. It is unknown whether the early symptom of a slightly enlarged spleen is a sign of a cancerous condition.[9] The current study investigated a number of variables and their relationships to splenomegaly. It is a debilitating illness that occasionally poses a threat to life. Further studies with more rigorous methods, longer follow-up, outcome determination, and a bigger sample size are required in order to successfully prevent and manage pancytopenia disease in patients with splenomegaly.[11]

One of the limitations of this study is the small sample size. Another limitation was the design of the study. To further validate the findings of this study, prospective, comparative studies can be designed.

CONCLUSION

The splenomegaly in common among patients with pancytopenia (2/3). It is significant among those middle-aged patients, and those with existing comorbidities like systemic hypertension and hypothyroidism. This is a significant clinical indication that requires careful investigation. Additional research is needed to confirm these associated factors and to determine the morbidity

and mortality linked to splenomegaly in pancytopenia patients.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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