Original Article

Assessment of the Clinic-pathological Profile of Patients with Pancytopenia

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Abstract

Introduction: Pancytopenia is an important clinico-hematological condition encountered in day-to-day clinical practice. Pancytopenia is often very difficult to diagnose and treat often owing to its varied aetiologies, causes might ranging from infections, nutritional deficiencies to malignancies. **Materials and Methods:** This was a cross-sectional study conducted in Department of General Medicine, Rohilkhand Medical College and Hospital, Bareilly. Patients' information was filled in pro forma, and contains patient's age, gender, clinical features, clinical findings, CBC findings, bone marrow findings, and diagnosis from all patients collected. Detailed clinical history and clinical examination along with blood investigation were carried out. **Results:** In the present study, the mean level of platelets was 54,000 ± 31,549/μL, with a minimum level of 2000/μL and a maximum level of 130,000/μL, indicating that majority of patients suffered from thrombocytopenia. The mean level of white blood cells (WBCs) was 2873.4 ± 780.4/μL, with a minimum level of 1000/μL and a maximum level of 3860/μL, indicating that all the patients suffered from leukopenia. 30% of patients had normocytic normochromic RBC, 24% had macrocytic normochromic RBC, 22% had macrocytic hyperchromic, 6% had microcytic normochromic, 8% had microcytic hypochromic, and 10% had both macrocytic and microcytic RBCs. **Conclusion:** Mean values of Hb, WBC & Platelet count was non-significantly higher among female patients comparing to males, though mean value of MCV was non-significantly higher in male patients comparing to females.

Keywords: Megaloblastic anemia, pancytopenia, platelet count

Introduction

An important hematological issue that arises frequently in clinical practice is pancytopenia. Anemia, leukopenia, and thrombocytopenia are caused by a decrease in all three major categories of produced blood components – erythrocytes, leukocytes, and platelets. Therefore, pancytopenia happens when the combination of a leukocyte count of fewer than 4000/L, a platelet count of <100,000/L, and a hemoglobin level of <9 g/dL occurs.[1]

The most common cause is drug, especially chemotherapy-induced bone marrow suppression. Other causes include bone marrow infiltration, marrow aplasia, ineffective hematopoiesis, and blood cell destruction or sequestration.[2] In most cases, pancytopenia manifests as bone marrow failure symptoms including pallor, dyspnea, bleeding, bruising, and an increased propensity to infections. Glossitis, diarrhea, and paresthesia were linked to megaloblastic anemia, whereas severe neutropenia and thrombocytopenia associated with sepsis and bleeding more typically represent underlying marrow aplasia or leukemia. Pancytopenia may result from a variety of illnesses, and each disease has a unique geographic distribution and genetic makeup. It is associated with multitude of disease state. Its presentation may be influenced by nutritional status, geography, socioeconomic conditions, and endemic illnesses. After excluding drug-induced bone marrow suppression, Vitamin B12 deficiency and aplastic anemia are the two most common causes of pancytopenia in India.[3]

Pancytopenia's etiology might range from a brief viral-induced marrow suppression to a life-threatening cancer entering

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the marrow. It may be caused by malignant cell infiltration, antibody-mediated bone marrow suppression, inefficient hematopoiesis and dysplasia, peripheral sequestration of blood cells in overactive reticuloendothelial system, or failure to produce hematopoietic progenitors in the bone marrow. The initial steps in identifying and analyzing pancytopenia were a complete blood count (CBC) and a peripheral smear examination taken into account in the context of a thorough medical history and appropriate physical examination, because it frequently indicates the pathophysiological process at play, the differential diagnosis, and the necessity for additional research.[4]

A look at both, western and Indian literature shows that there were few comprehensive studies on pancytopenia. In India, the causes of pancytopenia were not well defined. With the aim of evaluating the etiological and clinico-hematological profile of patient with pancytopenia and studying the utility of Bone-marrow examination. This study would help in planning the diagnostic and therapeutic approach in patients with pancytopenia. Thus the study undertaken to diagnose the cases of pancytopenia and to ascertain the cause for it, which would help initiating early and effective treatment.

Materials and Methods

Study setting

Department of General Medicine, Rohilkhand Medical College and Hospital, Bareilly, taken as cases in the study.

Study design

This was a cross-sectional study.

Study population

Pancytopenia patients attending the outpatient department (OPD) or admitted to Rohilkhand Medical College and Hospital, Bareilly, were enrolled in the study.

Sample size

Purposive selection of 50 patients within 1 year.

Study tools

Predesigned semi-structured questionnaire.

Study periods

The study period was from October 2018 to November 2019.

Inclusion criteria

Patients with pancytopenia were included in this study.

Exclusion criteria

- Patients who had monocytopenia
- Patients who do not give consent
- Patients who had chemotherapy
- Patients who had already received hematinics were excluded from the study.

Method of collection of data

Written and informed consent was taken from the patients who were willing to participate. Ethical clearance was taken from the institutional ethical committee (IEC/24/2018/OCT). Patients' information was filled in pro forma, and contains patient's age, gender, clinical features, clinical findings, CBC findings, bone marrow findings, and diagnosis from all patients collected. Detailed clinical history and clinical examination along with blood investigation were carried out.

Bone marrow aspiration and bone marrow trephine biopsy

A Jamshidi needle was used for aspiration of material from the posterior iliac crest or spine in adults. Bone marrow trephine biopsy specimen was obtained whenever necessary. Slides stained with Leishman's stain, then processed similar to histopathological sample and H and E sections were studied. Special stains such as periodic acid-Schiff (PAS), Pearl's iron stain, and reticulin were also done whenever necessary.

Procedure for bone marrow aspiration from posterior superior iliac spine

A patient was made to lie in lateral position, legs were flexed, and thighs were taken against the abdomen, so that the posterior superior iliac spine becomes prominent. The skin covering the posterior superior iliac spine and surrounding area was cleaned with 70% alcohol or 0.5% chlorhexidine and draped taking aseptic precautions. Skin, subcutaneous tissue, and periosteum overlying the selected site were infiltrated with a local anesthetic such as 2–5 mL of 2% lignocaine. Wait until the anesthesia effect had achieved. The oval posterior superior iliac spine's cavity was punctured perpendicularly with the Salah needle using a boring motion. A 1 cc syringe was added when the stiletto was removed, after the bone had been pierced. 0.2–0.4 mL of marrow contents was sucked up for making film. Needle and syringe were withdrawn together and marrow was poured onto the slides. Failure to aspirate marrow, i.e., a "dry tap," suggested that bone marrow biopsy should be done. Using a spreader slide, smears of marrow were made and the particles of marrow were carried to the end of the slide. The process of pouring marrow and making the slides was very quick to avoid clotting of marrow. Good marrow smears contain marrow particles as well as trails of particles. At least six smears were made.

Procedure for bone marrow biopsy

A patient was made to lie in lateral position, legs were flexed, and thighs were taken against the abdomen, so that the posterior superior iliac spine becomes prominent. The skin covering the posterior superior iliac spine and surrounding area was cleaned with 70% alcohol or 0.5% chlorhexidine and draped taking aseptic precautions. Skin, subcutaneous tissue, and periosteum overlying the selected site were infiltrated with a local anesthetic such as 2–5 mL of 2% lignocaine. Wait until the anesthesia effect had achieved. A small 2 mm cut was given with a sterile blade and Jamshidi needle was inserted into the bone, using a backward and forward rotation, and then rocked the needle gently from side to side to detach a core of tissue. The needle was then withdrawn in the reverse rotating

direction. A wire probe was inserted at the hub of needle onto a sterile gauge. The specimen was fixed in fixative overnight and decalcified with 10% formic acid for 72 h. Then, it was processed similar to histopathological sample and H and E sections were studied. Reticulin stain was done whenever necessary. After removing the needle, the biopsy site was covered with a tincture bandage. The pressure was applied to control bleeding. The patient's pulse and respiratory rate were monitored until they return to normal. The patient was in his lateral position for ½ h before getting dressed.

Data analysis

Data were inputted into a Microsoft Excel spreadsheet. It was examined with the aid of the programs OpenEpi and IBM SPSS Statistics for Windows, Version 20.0. (Armonk, NY: IBM Corp.). Chi-square test was used to determine whether there was a statistical correlation between two qualitative data that were cross-tabulated. P =0.05 or less is regarded as statistically significant.

Results

This was a patient-centered prospective observational study with pancytopenia attending OPD or admitted into Rohilkhand Medical College and Hospital, Bareilly, Utter Pradesh. Total 50 patients who met the criteria for inclusion were included in the current study.

Most of the male patients (n = 31) were between the ages of 16 and 25 years (38.7%), followed by 36–45 years (19.4%), 26–35 years (16.1%), 46–55 years (16.1%), and more than 55 years (9.7%). However, among female patients (n = 19), the majority of patients were between the ages of 16 and 35 years (52.6%), followed by 36 and 45 years (15.8%), 46–55 years (15.8%), and >55 years (15.8%) [Table 1].

In the present study, generalized weakness was present in all patients (100%). However, 66% of patients had dyspnea, 56% had fever, 14% had complaints of abdominal pain, 12% had loss of appetite, and 10% had complaints of palpitation. While other complaints such as headache (8%), generalized body ache (8%), vomiting and loose stool (6%) in few patients [Table 2].

In the present study, pallor was detected in all patients (100%). However, 30% of patients had pedal edema and 20% had icterus. Other clinical findings were bleeding manifestation (6%), yellowish eyes and urine (6%), hepatomegaly (4%), and splenomegaly (2%) present in certain patients [Table 3].

The mean value of hemoglobin (Hb) was 5.84 ± 1.98 g/dL, with a minimum level of 2 g/dL and a maximum level of 9 g/dL, indicating that all patients suffered from severe anemia. However, more than two-fifth (42%) of the patients had a Hb level between 7 and 9 g/dL, 24% had a Hb level between 5 and 6.9 g/dL, and 34% had a Hb level below 5 g/dL [Table 4].

In the present study, the mean level of platelets was 54,000 ± 31,549/µL, with a minimum level of 2000/µL and a maximum level of 130,000/µL, indicating that majority of patients suffered from thrombocytopenia. However, 8% of patients had a platelet count <10,000/µL, 48% had a platelet count between 10,000 and 50,000/µL, 40% had a platelet count between 50,001 and 100,000/µL, and 4% had a platelet count more than 1 lakh/µL [Table 5].

Table 1: Age- and gender-wise distribution of all patients

Age groups (years)	Gender		Total, *n* (%)
	Male, *n* (%)	Female, *n* (%)	
16–25	12 (38.7)	5 (26.3)	17 (34.0)
26–35	5 (16.1)	5 (26.3)	10 (20.0)
36–45	6 (19.4)	3 (15.8)	9 (18.0)
46–55	5 (16.1)	3 (15.8)	8 (16.0)
>55	3 (9.7)	3 (15.8)	6 (12.0)
Total	31 (100.0)	19 (100.0)	50 (100.0)

Table 2: Distribution of patients based on presenting complains

Presenting complains	Present, *n* (%)	Absent, *n* (%)	Total, *n* (%)
Generalized weakness	50 (100.0)	0	50 (100.0)
Dyspnea	33 (66.0)	17 (34.0)	50 (100.0)
Fever	28 (56.0)	22 (44.0)	50 (100.0)
Abdominal pain	7 (14.0)	43 (86.0)	50 (100.0)
Loss of appetite	6 (12.0)	44 (88.0)	50 (100.0)
Palpitation	5 (10.0)	45 (90.0)	50 (100.0)
Headache	4 (8.0)	46 (92.0)	50 (100.0)
Generalized body ache	4 (8.0)	46 (92.0)	50 (100.0)
Vomiting and loose stool	3 (6.0)	47 (94.0)	50 (100.0)

Table 3: Distribution of patients based on clinical findings

Clinical findings	Present, *n* (%)	Absent, *n* (%)	Total, *n* (%)
Pallor	50 (100.0)	0	50 (100.0)
Pedal edema	15 (30.0)	35 (70.0)	50 (100.0)
Icterus	10 (20.0)	40 (80.0)	50 (100.0)
Bleeding manifestation	3 (6.0)	47 (94.0)	50 (100.0)
Yellowish eyes and urine	3 (6.0)	47 (94.0)	50 (100.0)
Hepatomegaly	2 (4.0)	48 (96.0)	50 (100.0)
Splenomegaly	1 (2.0)	49 (98.0)	50 (100.0)

Table 4: Distribution of patients based on levels of hemoglobin

Levels of hemoglobin (g/dL)	Number of patients (%)
<5	17 (34.0)
5–6.9	12 (24.0)
7–9	21 (42.0)
Total	50 (100.0)

Mean±SD: 5.84±1.98 g/dL, Minimum: 2 g/dL, Maximum: 9 g/dL.
SD: Standard deviation

The mean level of white blood cells (WBCs) was 2873.4 ± 780.4/μL, with a minimum level of 1000/μL and a maximum level of 3860/μL, indicating that all the patients suffered from leukopenia. However, 16% of patients had a WBC count between 1000 and 2000/μL, 34% had a WBC count between 2001 and 3000/μL, and 50% had a WBC count between 3001 and 4000/μL [Table 6].

The mean level of mean corpuscular volume (MCV) of red blood cells (RBCs) was 103.3 ± 16.2 fL/red cell, with a minimum value of 70 fL/red cell and a maximum value of 129 fL/red cell. However, 12% of patients had an MCV level below normal limit (<80 fL/red cell), 20% had an MCV level within normal limit (80–96 fL/red cell), and 68% had an MCV level above normal limit (>96 fL/red cell) [Table 7].

Using peripheral blood smear morphology of RBCs was observed. It found that 30% of patients had normocytic normochromic RBC, 24% had macrocytic normochromic RBC, 22% had macrocytic hyperchromic, 6% had microcytic normochromic, 8% had microcytic hypochromic, and 10% had both macrocytic and microcytic RBCs [Table 8].

Many patients ($n = 28$) require bone marrow biopsy for further evaluation of pancytopenia.

Among them, 14 patients had erythroid hyperplasia with megaloblastic maturation, 2 had erythroid hyperplasia with megaloblastic and micronormoblastic maturation, 6 had megaloblastic erythropoiesis, 4 had hypoplastic bone marrow, 1 had dimorphic feature, and 1 had acute leukemia [Table 9].

In the present study, majority of the patients (96%) had no complication, while 2% of patients had bleeding gums and 2% had petechial hemorrhage [Table 10].

In the present study, majority of the patients suffered from megaloblastic anemia (42%), 26% suffered from malaria (*Plasmodium vivax* + *Plasmodium falciparum*), 8% suffered from aplastic anemia, 6% suffered from dimorphic anemia, 6% suffered from typhoid fever, 4% suffered from dengue fever, and 4% suffered from chronic liver disease and others [Table 11].

Table 5: Distribution of patients based on levels of platelets in blood

Platelets level in blood (/μL)	Number of patients (%)
<10,000	4 (8.0)
10,000–50,000	24 (48.0)
50,001–100,000	20 (40.0)
>100,000	2 (4.0)
Total	50 (100.0)

Mean±SD: 54,000±31,549/μL, Minimum: 2000/μL, Maximum: 130,000/μL. SD: Standard deviation

Table 6: Distribution of patients based on levels of white blood cells

WBC (/μL)	Number of patients (%)
1000–2000	8 (16.0)
2001–3000	17 (34.0)
3001–4000	25 (50.0)
Total	50 (100.0)

Mean±SD: 2873.4±780.4/μL, Minimum: 1000/μL, Maximum: 3860/μL. SD: Standard deviation, WBC: White blood cell

Table 7: Distribution of patients based on levels of mean corpuscular volume

MCV (fL/red cell)	Number of patients (%)
Below normal limit (<80)	6 (12.0)
Within normal limit (80–96)	10 (20.0)
Above normal limit (>96)	34 (68.0)
Total	50 (100.0)

Mean±SD: 103.3±16.2 fL/red cell, Minimum: 70 fL/red cell, Maximum: 129 fL/red cell. SD: Standard deviation, MCV: Mean corpuscular volume

Table 8: Distribution of patients based on morphology of red blood cell

RBC morphology	Number of patients (%)
Normocytic normochromic	15 (30.0)
Macrocytic normochromic	12 (24.0)
Microcytic normochromic	3 (6.0)
Microcytic hypochromic	4 (8.0)
Macrocytic hyperchromic	11 (22.0)
Macrocytic and microcytic	5 (10.0)
Total	50 (100.0)

RBC: Red blood cell

Discussion

Pancytopenia is a common hematological condition seen in clinical practice. It has a variety of underlying causes, and the underlying pathology determines how to treat the patient and what their prognosis will be.

Age and gender of the patients

Patients in the current study ranged in age from 16 to 75 years, with a mean age of 36.4 ± 16.2 years. Similar mean age (36.9 years, range: 13–65 years) was noted by Santra and Das.[5] Due to the inclusion of pediatric patients in their trials, the mean age reported by Yadav *et al*.[6] (26.6 years, range: 0.5–70 years) and Raphael *et al*.[7] (30 years, range: 1–79 years) was lower. The greater prevalence of certain etiologies in the adult age group may be the cause of the higher mean ages reported by Thakkar *et al*.[8] (42.9 years, range: 13–86 years) and Barik *et al*.[9] (42 years, range: 5–80 years).

In the current study, 34% of patients were between the ages of 16 and 25 years, 20% were between the ages of 26 and 35 years, 18% were between the ages of 36 and 45 years, 16% were between the ages of 46 and 55 years, and 12% were over the age of 55 years. 26.7% of participants in a study by Yadav *et al*.[6] were aged 0–14 years, 40% were aged 15–34 years, and 33.3% were aged 35 years or over. The most prevalent age brackets, according to

Table 9: Distribution of patients based on bone marrow findings

Bone marrow findings	Number of patients (%)
Not done	22 (44.0)
Erythroid hyperplasia with megaloblastic maturation	14 (28.0)
Erythroid hyperplasia with megaloblastic and micronormoblastic maturation	2 (4.0)
Megaloblastic erythropoiesis	6 (12.0)
Hypoplastic bone marrow	4 (8.0)
Dimorphic features	1 (2.0)
Acute leukemia	1 (2.0)
Total	50 (100.0)

Table 10: Distribution of patients based on complication

Complication	Number of patients (%)
No complication	48 (96.0)
Bleeding gums	1 (2.0)
Petechial hemorrhage	1 (2.0)
Total	50 (100.0)

Table 11: Distribution of patients based on final diagnosis

Final diagnosis	Number of patients (%)
Megaloblastic anemia	21 (42.0)
Aplastic anemia	4 (8.0)
Dimorphic anemia	3 (6.0)
Malaria (*Plasmodium vivax*)	12 (24.0)
Malaria (*Plasmodium falciparum*)	1 (2.0)
Typhoid fever	3 (6.0)
Dengue fever	2 (4.0)
Chronic liver disease	2 (4.0)
Alcoholic liver disease with megaloblastic anemia	1 (2.0)
Acute leukemia	1 (2.0)
Total	50 (100.0)

Jain and Naniwadekar,[10] were 21–30 years and 31–40 years, respectively. The most prevalent age groups, according to Santra and Das,[5] were 13–30 years and 31–45 years (36.9% and 35.1%, respectively). The age group of 70–80 years had the fewest incidences of pancytopenia (5%). According to Patel *et al*.,[11] the most common age groups afflicted were those between the ages of 15 and 25 years (30.5%), 26 and 35 years (22.6%), 36 and 45 years (16.4%), and 46 and 55 years (11%). According to a study by Barik *et al*.,[9] the majority of the patients were between the ages of 5 and 20 years and 21 and 35 years. According to Yadav *et al*.,[12] 73.3% of patients were under 30 years old. The most prevalent age range, according to Javalgi and Dombale,[13] was 15–25 years (39.6%). Most research has found that pancytopenia is most common in people between the ages of 15 and 25 years,[6,8,13] which is similar to the current study. Nearly all research noted that it was least common in elderly people, as seen in the current study. This might be explained by the fact that the most typical etiology was common in this reproductive age group. According to Hamid and Shukry[14] and Basak,[15] the most prevalent ages were 16–30 years and 41–50 years, respectively.

In the current study, the male-to-female ratio was 1.63:1, with 62% of patients being men and 38% women [Table 5]. Similar male preponderance was observed in studies by Barik *et al*.[9] (1.6:1), Santra and Das,[5] Yadav *et al*.[6] (1.76:1), Thakkar *et al*.[8] (1.1:1), Javalgi and Dombale[13] (1.35:1), Jain and Naniwadekar,[10] and Basak[15] (1.7:1). However, Aziz *et al*.[16] (1:1.2) reported that women predominated in their study. Female patients (n = 19) were more likely to be between the ages of 16 and 35 in the current study, whereas male patients (n = 31) were more likely to be between the ages of 16 and 25 (38.7%) and 36 and 45 (19.4%) (52.6%) and aged between 36 and 45 (15.8%) [Table 6].

Distribution of patients based on clinical features

The most prevalent clinical characteristics in the current investigation were pallor (100%) and generalized weakness (100%). Dyspnea (66%) and fever (56%) are common symptoms, as are pedal edema (30%), icterus (20%), abdominal pain (14%), and others [Tables 7 and 8]. The most frequent clinical symptoms, according to a research by Yadav *et al*.,[12] were weakness (97.8%), pallor (98.3%), shortness of breath (75%), fever (70%), splenomegaly (25.5%), and hepatomegaly (18.3%). Pallor (84.7%), fatigability (74.8%), fever (50.5%), weakness (45%), splenomegaly (44.1%), and bleeding (41.4%) were reported to be the most prevalent clinical characteristics in a research by Santra and Das.[5]

The most prevalent clinical characteristics, according to Gayathri and Rao's study,[17] were generalized weakness (100%), dyspnea (43.3%), fever (38.5%), splenomegaly (35.6%), and hepatomegaly (26.9%). The most frequent symptoms, according to Thakkar *et al*.,[8] were pallor (100%), weakness (97%), and fever (70%). Generalized weakness and pallor were the most prevalent clinical findings in Sharma *et al*. study,[18] followed by fatigability (65%), dyspnea (52%), lymphadenopathy (14%), and hepatomegaly (12%).

Distribution of patients based on levels of hemoglobin

Hemoglobin had mean values of 5.84 ± 1.98 g/dL in the current investigation. Similar ranges of hemoglobin mean values were seen in studies by Yadav *et al*.,[12] 5.57 1.93 g/dL, and Santra and Das,[5] 5.9 1.9 g/dL. While Hamid and Shukry[14] recorded a lower mean value (5.4 1.9 g/dL), and Thakkar *et al*.[8] recorded a higher mean value of Hb (6.2 g/dL), respectively. However, in the present investigation, 100% of the patients had severe anemia [Table 9]. While Santra and Das's study[5] discovered that anemia was mild in 2.7% of cases, moderate in 39.6%, and severe in 57.7% of cases. While Thakkar *et al*.[8] had discovered that incidences of mild anemia were 25%, moderate anemia was 51%, and severe anemia was 24%.

Distribution of patients based on levels of white blood cells

WBC levels in this study were 2873.4 ± 780.4/L on average [Table 11]. This average WBC count was higher than

those reported in studies by Thakkar *et al*.[8] (2450/mm^3), Hamid and Shukry,[14] and Santra and Das[5] (216,9821/mm^3).

In the current investigation, however, all patients developed leukocytopenia [Table 11]. While Santra and Das's study[5] discovered that 40.55% of patients had mild leukopenia, 54.95% had moderate leukopenia, and 4.5% had severe leukopenia.

Distribution of patients based on levels of platelets in blood

The mean platelet count in the current study was 54,000 ± 31,549/L [Table 10], which was lower compared to a research by Hamid *et al.*,[16] which measured 5990028600/mm^3, but higher compared to studies by Santra and Das[5] (45200 38600/L) and Thakkar *et al*.[8] (43,500/mm^3).

Although a study by Santra and Das[5] found that 14.4% of patients had severe thrombocytopenia, 25.2% had moderate thrombocytopenia, and 60.4% had mild thrombocytopenia. According to Patel *et al*.,[11] 11.5% had severe thrombocytopenia, 32.3% had moderate, and 56.2% had mild thrombocytopenia. 25.5% of participants in a research by Javalgi and Dombale[13] had platelet counts below 50,000/mm^3, 33.1% had platelet counts between 50,000 and 10,000/mm^3, and 41.5% had platelet counts between 100,001 and 150,000/mm^3.

Distribution of patients based on levels of mean corpuscular volume

The mean MCV in the current study was 103.316.2 fL/red cell. While lower mean MCV values (84.711.9 fL/red cell) were recorded by Hamid *et al*.[16] However, 12% of patients had MCV levels that were below the normal range (80 fL/red cell), 20% had MCV levels that were between the normal range (80–96 fL/red cell), and 68% had MCV levels that were above the normal range (>96 fL/red cell). According to a study increased MCV occurred in 28.8% of instances, decreased MCV in 23.5% of cases, and normal MCV in 47.8% of cases.

In the present study, 30% of the patients had RBC that was normocytic normochromic, 24% had RBC that was macrocytic normochromic, 22% had RBC that was macrocytic hyperchromic, 10% had RBC that was both macrocytic and microcytic, 8% had RBC that was microcytic hypochromic, and 6% had RBC that was microcytic normochromic. Anisopoikilocytosis was reported to be the most common feature in peripheral smears, according to a study by Yadav *et al*.[12]

Conclusion

In the present study, majority of the patients were 16–35 years old (54%) and 62% were males. The most common clinical features were generalized weakness (100%), pallor (100%), dyspnea (66%), and fever (56%). However, 100% of patients had Hb ≤ 9 g/dL, 96% had a platelet count below 100,000/μL, and 100% had WBC below 4000/μL, while 12% of patients had an MCV level below normal limit and 68% had an MCV level above normal limit. On peripheral blood film examination, 46% of patients had macrocytic RBC, 14% had microcytic RBC, and 10% had both macrocytic and microcytic RBCs. Bone marrow biopsy found hyperplastic bone marrow in majority of the patients and hypoplastic bone marrow only in four patients. The most common cause of pancytopenia in the present study was megaloblastic anemia (42%), followed by malaria (26%), aplastic anemia (8%), dimorphic anemia (6%), typhoid fever (6%), and others. The mean value of Hb, WBC, and platelet count was nonsignificantly higher among female patients compared to males, though the mean value of MCV was nonsignificantly higher in male patients compared to females.

Limitation of study

The present study was conducted as a part of thesis in RMCH, Bareli. Data showed the results of the single center only. Small sample size was also one of the limitations.

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Conflicts of interest

There are no conflicts of interest.

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