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ORIGINAL ARTICLE

Evaluation of pancytopenia based on bone marrow examination in adults in a tertiary care hospital in Islamabad.

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ABSTRACT… Objective: To evaluate etiological spectrum of pancytopenia in adults using bone marrow aspiration biopsy. **Study Design:** Randomized Prospective study. **Setting:** Department of Pathology, Pakistan Institute of Medical Sciences, Islamabad. **Period:** October 2018-October 2020. **Material & Methods:** Eight hundred bone marrow biopsies were performed out of which 250 patients came with pancytopenia. 135 patients out of these were in adult age group which are included in this study. **Results:** Out of 250 patients adults were 135 that presented with pancytopenia. Male to female ratio came out to be 1.22:1. The most common disorder that results in pancytopenia came out to be megaloblastic anemia that was 29.6%, after that 26.6% were infection related changes, 10.3% aplasia, 9.6% reactive marrow, 5.9% acute leukemia, 3.7% chronic leukemia and iron deficiency anemia followed by 2.9% myelodysplastic syndromes and hypersplenism, 2.2% multiple myeloma, 1.4% mixed deficiency anemia and 0.74% myelofibrosis. We also analyzed patients on their presenting complaints as well. Most common complaint of presentation was fever (54.8%), (31.85%) with fatigue and malaise, (31.1%) pallor, vomiting and diarrhea (25.9%) followed by bleeding (14.8%). On clinical examination 12% cases presented with hepatomegaly and 16.6% with splenomegaly. **Conclusion:** Pancytopenia is a common hematological finding in our setup with megaloblastic anemia to be the most common cause of it. Therefore, it's very important to diagnose it as this is a curable (reversible) deficiency and patients can easily be managed to prevent serious hematological and neurological abnormalities.

Key words: Bone Marrow Aspiration, Infections, Megaloblastic Anemia, Pancytopenia.

INTRODUCTION

Patients presenting with pancytopenia are relatively common issue in our setups. It is a challenge to timely evaluate and find the underlying cause of pancytopenia in routine clinical practice.[1] It can be defined as decrease values in all the cell lines that is red blood cell count/hemoglobin, white blood cell count and platelet count leading to decrease in hemoglobin, total leucocyte counts and platelet levels causing anemia, leukopenia and thrombocytopenia in patients.[2,3] Usually the patients with pancytopenia presents with signs of easy bruising, pallor, history of repeated infections and bleed.[4,5]

Patients with pancytopenia usually present with unexplained fatigue, weakness, difficulty in breathing, history of repeated infections, easy bruising, easy gum bleeds owing to decline in values of all the cell lines.[6,7,8]

Pancytopenia can be defined as hemoglobin less than 10g/dl, with an absolute neutrophil count of 1.5 × 10/L or less and a platelet count of less than 100 ×10 /L.[9,10] The etiology of pancytopenia in all individuals ranges from brief marrow suppression to marrow infiltration by metastatic carcinomas.[11] It results from failure of production of hemopoetic stem cells due to their replacement by tumor cells or fibrosis. It can be constitutional, resulting from an inherited genetic defect or can be acquired that can be due to immune related damage to stem cells or their surrounding microenvironment.[12,13]

The presence of pancytopenia apart from chemotherapy or radiotherapy is a common

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diagnostic dilemma and a bone marrow aspiration biopsy is recommended.[14,15]

Some of the important causes of pancytopenia includes aplastic anemia, cancers, autoimmune diseases, chemotherapy, infections, megaloblastic anemia, fanconi's anemia and many more.[16]

We conducted a study in our hospital to know the percentage of possible causes of pancytopenia in our population because many of them are easily treatable which we encounter in routine practice.

MATERIAL & METHODS

A prospective hospital based study was done at department of pathology in Pakistan Institute of Medical Sciences, Islamabad over a period of two years from October 2018 to October 2020. All the patients presented in OPD were diagnosed with pancytopenia on complete blood picture along with peripheral film.

Total 800 bone marrow biopsies were performed in our pathology department in these two years out of which a total of 135 patients were adults that presented with pancytopenia. Using automated cell counter (Sysmex) pancytopenia was confirmed in patients. Pancytopenia is defined as hemoglobin of less than 10g/dl, an absolute neutrophil count of equals to or less than 1.5 × 10/L and platelet count less than 100 ×10 /L (3). Decreased platelet count was confirmed manually by performing peripheral blood film exam. Bone marrow aspiration and biopsy was done in all cases of pancytopenia. Special stains were used like myeloperoxidase where necessary. Various related causes/diagnoses of pancytopenia were recorded, and results were drawn accordingly. Mean and standard deviation both were calculated for quantitative variables e.g. age. Frequencies and percentages were calculated for qualitative variables like diagnosis and gender. Data was scrutinized using SPSS version 20. Approval from ethical review board was obtained (No. F. 1-1/2015/ERB/SZAMBU) along with informed consent was taken from patients.

Patients of age 15 year and above, including both sexes and fulfilling the criteria for pancytopenia were all included in this study. Patients whose bone marrow aspirate sample was not enough or could not give any proper diagnosis were excluded from this study. All the patients who were on radiotherapy, chemotherapy and are already diagnosed patients of pancytopenia were also removed from the study.

RESULTS

Out of 135 pancytopenia patients presented, 1.2:1 was the male to female ratio. Common conditions that are related with pancytopenia was macrocytic (megaloblastic) anemia, following infections, aplastic anemia, reactive marrow, acute leukemia and hypersplenism.

Most associated symptom with which patients presented was fever (54.8%), followed by fatigue with malaise (31.8%), (31.1%) patients presented with pallor, vomiting and loose stools (25.9%) and bleeding from gums and various other sites (14.8%).

During clinical examination organomegaly was observed in 52 patients out of 135 patients. In total 17% patients presented with hepatosplenomegaly, 8.8 % with hepatomegaly and 12.5% with splenomegaly.

Average age of study sample is from 18 years to 67 years with an average age of 46 years + 15.4 SD.

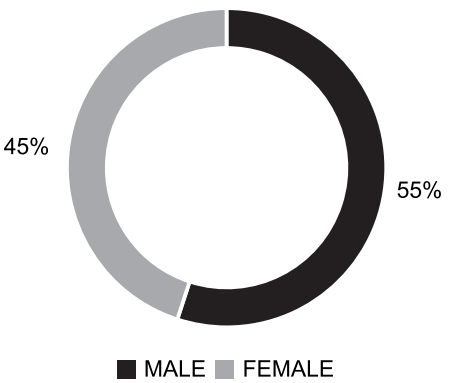

Figure-1. Representing gender distribution among patients

Disease	No of Cases (n=137) (%)
Myelofibrosis	1 (0.74%)
Mixed Deficiency Anemia	2 (1.48%)
Multiple Myeloma	3 (2.22%)
MDS	4 (2.96%)
Hypersplenism	4 (2.96%)
Chronic Leukemia	5 (3.70%)
IDA	5 (3.70%)
Acute Leukemia	8 (5.93%)
Reactive Marrow	13 (9.63%)
Aplasia	14 (10.37%)
Infection Related Changes	36 (26.67%)
Megaloblastic Anemia	40 (29.63%)

Table-I. Etiological spectrum of diseases in adults presented with pancytopenia

Symptoms	No of Cases (n=137)	Percentage
Fever	74	54.8 %
Bodyaches	43	31.8 %
Pallor	42	31.1 %
Diarrhea &Vomiting	35	25.92 %
Bleeding	20	14.8 %

Table-II. Distribution of cases according to their presenting complaints

DISCUSSION

Pancytopenia is very common hematological condition in our population.[17,18] Patients with symptoms like bleeding, bruises, fever etc must be investigated for pancytopenia using complete blood count.[19] As a wide variety of malignant and non- malignant diseases can be presented with complaints related to pancytopenia. For a confirmative diagnosis bone marrow examination should be done.[20]

There are various studies that has been done to view the etiological spectrum of pancytopenia. There are various diseases that results into pancytopenia which vary depending upon the health status, genetic variation and difference in the geographical areas.[20,21]

In present study, commonest cause related to pancytopenia came out to be megaloblastic anemia (29.6%), second being the infections (26.6%), followed by aplasia (10.3%). All these conditions were diagnosed on evaluating complete blood count, peripheral film and bone morrow examination. For diagnosis of leukemia's special stains were used along with immunohistochemistry.

A similar study was conducted by Farooque R, Iftikhar S, Herekar F, Patel MJ in Karachi, Pakistan in which megaloblastic anemia (41.7%) was the leading cause for pancytopenia like in our study, followed by cases of hypersplenism (16.6%) as the second most common cause, ours being the infection.[3]

In 2018 a study was conducted in India studying the spectrum of pancytopenia in adults in which the leading cause of pancytopenia again came out to be megaloblastic anemia that was a similar to the result of ours. In this study the commonest mode of presentation was weakness/fatigue (55%) followed by fever (33%). However the leading complaint in our study is fever (54.8%) followed by body aches (31.8%).[6]

Jain A. did a study in India to study the spectrum of pancytopenia presenting in their hospital. The commonest complaint in this study is same as in our study that is fever (60%). The result of their study is quite similar to ours as megaloblastic (macrocytic) anemia was the most common cause resulting pancytopenia (37%), second being the dimorphic anemia (26%).[5]

More of such studies were done by Zeeshan R in 2019 in Pakistan and by Doshi D in 2012. Both the studies showed very similar results as compared to our study. Megaloblastic anemia (27.8% and 45%) was again the leading cause resulting into pancytopenia.[7,13]

All the above studies were conducted in Asian countries including ours too. So we can possibly say that megaloblastic anemia one of the leading cause resulting into pancytopenia that can be explained in terms of poor health and nutritional status in these developing countries which is the possible reason of developing megaloblastic anemia in them.

However, a study conducted in Mexico in 2019

by C.J.VARGAS-CARRETERO et al. in which in contrast to this study, their leading cause resulting into pancytopenia came out to be myelodysplastic syndrome (20.2%) followed by megaloblastic anemia (18.3%) and acute leukemia's (12.8%). The most common presenting complaint was pallor (82%) in contrast to ours which was fever.[8]

Nell EM did a similar study in South Africa in 2022 to know the causes of pancytopenia in which came out as 25%, chemotherapy, 18% sepsis and 9% malignancy cases.[12]

That was also quite contrary to our study and other studies that were done in Asian countries in which megaloblastic (macrocytic) anemia was among the leading cause resulting into pancytopenia in patients.

CONCLUSION

Pancytopenia is a common hematological finding in our setup with megaloblastic anemia to be the most common cause of it. Therefore, it's very important to diagnose it as this is a curable (reversible) deficiency and patients can easily be managed to prevent serious hematological and neurological abnormalities.

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REFERENCES

1. Yokus O, Gedik H. **Etiological causes of pancytopenia: A report of 137 cases.** Avicenna J Med. 2016 Oct; 6(04):109-12. doi: 10.4103/2231-0770.191447

2. Jan AZ, Zahid B, Ahmad S, Gul Z. **Pancytopenia in children: A 6-year spectrum of patients admitted to Pediatric Department of Rehman Medical Institute, Peshawar.** Pak J Med Sci. 2013 Sep; 29(5):1153. DOI: 10.12669/pjms.295.3865

3. Farooque R, Iftikhar S, Herekar F, Patel MJ. **Frequency and etiology of pancytopenia in patients admitted to a tertiary care hospital in Karachi.** Cureus. 2020 Oct 20; 12(10). DOI: 10.7759/cureus.11057

4. Desalphine M, Bagga PK, Gupta PK, Kataria AS. **To evaluate the role of bone marrow aspiration and bone marrow biopsy in pancytopenia.** J Clin Diagn Res. 2014 Nov; 8(11):FC11. DOI: 10.7860/JCDR/2014/9042.5169

5. Jain A, Garg R, Kaur R, Nibhoria S, Chawla SP, Kaur S. **Clinico-hematological profile of pancytopenic adult patients in a tertiary care teaching hospital.** Tzu-Chi Med J. 2022 Jan; 34(1):95. DOI: 10.4103/tcmj.tcmj_17_21

6. 4. Mazumdar P, Kumar D, Das M, Vidyapati, Kumar C. **A study of etiology and clinical profile of pancytopenia in adults.** Int J Sci Res. 2018; 7 (10): 322-323. DOI: 10.36106/ijsr

7. Zeeshan R, Irshad B, Aslam MA, Khan MT, Bhatti HW, Chaudhary NA. **A spectrum of hematological disorders in children with pancytopenia based on bone marrow examination in a tertiary care hospital.** Cureus. 2019 Jul 11; 11(7). DOI: 10.7759/cureus.5124

8. Vargas-Carretero CJ, Fernandez-Vargas OE, Ron-Magaña AL, Padilla-Ortega JA, Ron-Guerrero CS, Barrera-Chairez E. **Etiology and clinico-hematological profile of pancytopenia: experience of a Mexican Tertiary Care Center and review of the literature. Hematology.** 2019 Jan 1; 24(1):399-404. DOI: 10.1080/16078454.2019.1590961

9. Patel GR, Prajapati GR. **Spectrum of pancytopenia in adults attending a clinical hematology department: A four-year experience from a tertiary care center of western India.** Cureus. 2022 May 12; 14(5). DOI: 10.7759/cureus.24933

10. Gnanaraj J, Parnes A, Francis CW, Go RS, Takemoto CM, Hashmi SK. **Approach to pancytopenia: Diagnostic algorithm for clinical hematologists.** Blood reviews. 2018 Sep 1; 32(5):361-7. DOI: 10.1016/j.blre.2018.03.001

11. Weinzierl EP, Arber DA. **The differential diagnosis and bone marrow evaluation of new-onset pancytopenia.** Amc J of clin path. 2013 Jan 1; 139(1):9-29. DOI: 10.1309/AJCP50AEEYGREWUZ

12. Nell EM, Chapanduka ZC. **Aetiology of pancytopenia: Experience of a South African tertiary academic centre.** Afr J Lab Med 2022 May 31; 11(1):1645. DOI: 10.4102/ajlm.v11i1.1645

13. Doshi D, Shah AN, Somani S, Jain A, Jivarajani H, Kothari P. **Study of clinical and aetiological profile of 100 patients of pancytopenia at a tertiary care centre in India.** Hematology. 2012 Mar 1; 17(2):100-5. DOI: 10.1179/102453312x13221316477976

14. Kaur N, Nair V, Sharma S, Dudeja P, Puri P. **A descriptive study of clinico-hematological profile of megaloblastic anemia in a tertiary care hospital.** Med J Armed Forces India. 2018 Oct 1; 74(4):365-70. DOI: 10.1016/j.mjafi.2017.11.005

15. Costanzo G, Sambugaro G, Mandis G, Vassallo S, Scuteri A. **Pancytopenia secondary to Vitamin B12 deficiency in older subjects.** J Clin Med. 2023 Mar 6; 12(5):2059. DOI: 10.3390/jcm12052059

16. Alim M, Verma N, Kumar A, Pooniya V, Rahman RA, Rahman RA. **Etio-hematological profile and clinical correlates of outcome of pancytopenia in children: Experience from a tertiary care center in North India.** Cureus. 2021 Jun 2; 13(6). DOI: 10.7759/cureus.15382

17. Zubair AB et al. **Clinical characteristics and etiological spectrum of pancytopenia in pediatric age group: A Cross-Sectional Outlook from a developing country.** Cureus. 2022 Aug 10; 14(8). DOI: 10.7759/cureus.27842

18. Sasi S, Yassin MA. **A rare case of acquired hemolytic anemia and pancytopenia secondary to pernicious anemia.** Case Rep Oncol. 2020; 13(2):783-8. DOI: 10.1159/000507981

19. Depuis Z, Gatineau-Sailliant S, Ketelslegers O, Minon JM, Seghaye MC, Vasbien M, Dresse MF. **Pancytopenia due to Vitamin B12 and Folic Acid Deficiency—A Case Report.** Pediatr Rep. 2022 Mar 3; 14(1):106-14. DOI: 10.3390/pediatric14010016

20. Chen P, Ramachandran P, Josan K, Wang JC. **Pancytopenia and TTP-like picture secondary to pernicious anaemia.** BMJ Case Reports CP. 2020 Jul 1; 13(7):e235288. DOI: 10.1136/bcr-2020-235288

21. Gajbhiye SS, Karwa AR, Dhok A, Jadhav SS, Gajbhiye S, Karwa Sr A. **Clinical and etiological profiles of patients with pancytopenia in a Tertiary Care Hospital.** Cureus. 2022 Oct 18; 14(10). DOI: 10.7759/cureus.30449.

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2	Bushra Anam Ali	Conceived and Designed the analysis, Data collection.	
3	Shahzad Ali Jiskani	Study design, Interpretation of data.	
4	Maryam Waqar	Data collection, Data analysis.	
5	Maliha Saad	Data interpretation, Discussion.	
6	Humera Javed	Paper review, Data collection.	