Sociodemographic and Hematologic Profile of Breast Cancer Patients Attending a Tertiary Care Teaching Hospital in Ethiopia: Case Control Study

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Abstract

Background: Breast cancer is among the leading causes of cancer death in women. Different socio-demographic factors have impact on early diagnosis and treatment of breast cancer. Hematological abnormalities are also some of the conditions to be monitored during diagnosis and treatment of breast cancer.

Objective: To describe socio demographic and hematologic profile of patients with breast cancer at Tikur Anbessa Specialized Hospital.

Methods: Case control study was conducted from May 2018 to June 2019. A total of 230 cases and 230 controls participated in the study. Descriptive analysis was made to assess the socio demographic characteristics. Blood samples for hematological parameters were analyzed, using SYSMEXKX21N hematology analyzer. Independent student t- test was performed to compare the mean hematological parameters of cases and controls.

Results: The mean age was 42.8 ± 12.1 and 39.3 ± 11.1 years for cases and controls, respectively. One hundred (43%) of cases and 34 (14.8%) of controls were illiterate. Moreover, 175 (76.1%) of cases and 155 (67.4%) of controls were married. The mean value of Hemoglobin, Red Blood cell, Packed Cell Volume ($13.1 \pm 1.6\text{g/dl}$, $4.6 \pm 0.54/10^{12}/\text{L}$, $38.7 \pm 4.5\%$, respectively) of cases were significantly lower than the controls ($14.0 \pm 1.3\text{g/dl}$, $4.8 \pm 0.47 / 10^{12}/\text{L}$, $40.5 \pm 3.5\%$ respectively). The mean platelet and total WBC count were $323.4 \pm 108.1 \times 10^9/\text{L}$ and $7.1 \pm 2.8 \times 10^9/\text{L}$ for cases and $282.0 \pm 70.0 \times 10^9/\text{L}$, and $7.1 \pm 2.4 \times 10^9/\text{L}$ for controls respectively. In addition, 20.4% of cases and 5.6 % of controls were anemic based on their hemoglobin value.

Conclusion and recommendations: The majority of breast cancer cases were less than 40 years of age and illiterate. Most of the RBC parameters of cases were significantly lower than the controls. Therefore, attention should be given to those with the designated hematologic abnormalities.

Background

Breast cancer is the leading cause of cancer deaths in women, accounting for 15.0% of the deaths (1). Even though there are significant improvements in breast cancer prognosis and survival, it is still the leading cause of mortality in low- and middle-income countries (1-3). In most African countries, cancer control programs and the provision of early detection and treatment services are limited, despite the increasing burden (4).

Socio demographic factors affecting Breast Cancer

Socio-demographic factors are reckoned to be associated with breast cancer. Based on the findings of systematic review and meta-analysis in Europe, higher socioeconomic status of women was significantly

associated with higher breast cancer incidence (5). In a study conducted in Baghdad on 250 female breast cancer patients, their ages ranged between 42 and 73 years, with a mean $\pm$ SD of 56 ± 6 years (6). Those younger than 50 years constituted 19.6% of the sample, while those older than 59 years made 22% of the study participants. Majority, 54.8% of them completed their secondary school education. Furthermore, 60.8% were married, 44% were unemployed and 25.2% were rural residents. . According to a study done in Iraq, the mean age at the presentation was 51 ± 10.6 years; patients less than 50 were 46.8% (7). Overall, 88% were married, 22.4% were illiterate and 19.2% graduated from universities. A WHO survey which was done on socio-economic and health access determinants of breast and cervical cancer screening in Low-Income Countries found that significant determinants of cancer screening were household socio economic status, rural residence, country health expenditure, as well as healthcare access (8). A study conducted in Nigeria also indicated that, socio-demographic factors increased risk of late presentation (9).

Ethiopia is undergoing a rapid economic transformation that has increasingly been accompanied by changes in the dietary and lifestyle behaviors of the population, contributing to rising risks of preventable chronic illnesses. The double burden of communicable and chronic diseases is a challenge to the health as well as to the national socio economic development. Chronic non communicable diseases are posing a formidable social and economic burden on individuals, families and the nation at large (10). Breast cancer trend is increasing and it is the most prevalent type of cancer (11,12). In general, cancer accounts for about 5.8% of the total national mortality in the country and breast cancer is the most prevalent cancer (13).

Hematological profile and breast cancer

Hematological abnormalities are common features to be considered in breast cancer patients. Those parameters could be used as one of the important biochemical tools in the diagnosis of additional co-morbidities and treatment monitoring in breast cancer patients. They are cost effective and can be easily examined in less complex laboratories that do not have access to sophisticated technology for demonstration of more reliable cancer markers (14). Studies indicate hematological parameters as important investigations that are useful prognostic factors for evaluating the accuracy of risk stratification in breast cancer patients (15, 16). For example, a study done in south western Nigeria showed that HB, PCV, RBC and WBC were significantly lower in patients compared to controls (16). Another study done in Nigeria also showed that mean MCV, MCH, MCHC in cases were lower than in controls (17). Be careful of your spacing.

Mean PCV, RBCs and WBCs, platelet values were significantly lower in patients compared to the controls based on the study done in Iraq (18). Another study from Malaysia revealed significant decrease of hemoglobin among 22% of breast cancer patients (19). Based on study in Ethiopia, there is poor community awareness towards breast cancer (20). Studies also indicated that 80 to 90% of patients already suffer from advanced and incurable cancers at the time of diagnosis (20-22). Socio-demographic factors are the determinants of health-related behavior. It is also indicated that socio-demographic

factors may have effect on late presentation and contribute to treatment delay, neglecting symptoms and illnesses as well as late notifications to clinicians (9).

Since breast cancer is associated with lifestyle, it is important to investigate and understand various socio-demographic elements of patients with the disease. This study may help to identify the target group for counseling, and awareness creation, depending on their needs in the general population. Even though, breast cancer incidence has increased rapidly in Ethiopia (13), there is still lack of adequate studies that investigated socio demographic and hematological profile of breast cancer patients in order to design and implement strategies which can be helpful for prevention and improve the outcome of patients. It is important to assess hematological status of breast cancer patients at regular intervals during different stages of treatment in order to determine their diagnostic and prognostic values, which can help for improved management. Therefore, this study was aimed to describe socio demographic and hematologic profile of patients with breast cancer at Tikur Anbessa Specialized Hospital.

Materials And Methods

Study design and period

Facility based case control study was conducted between May 2018 to June 2019 in Addis Ababa at Tikur Anbessa Specialized Hospital (TASH) Oncology Department. Cases and controls were matched based on residence.

Eligibility criteria

All newly diagnosed breast cancer patients with confirmed histology result, no observable mental disorders, no history of chronic disease and aged 18years and above were included in the study. Regarding controls, individuals free from breast mass after physical examination, non-pregnant women and women who were not on menstruation period and individuals who had no biological relationship with selected cases were included.

Sampling and sample Size determination

Since there was only one referral center for cancer treatment during the study period, purposive sampling technique was used to select the study area (TASH). Convenient sampling technique was used to select study participants. A total of 460 participants (230 cases and 230 controls) participated in this study.

Data collection procedure

Informed consent was obtained from each study participant prior to data collection. Participants were interviewed in a convenient place to maintain privacy and confidentiality. Hematological testes were

routinely done for treatment of each breast cancer case before any kind of treatment; hence, the result of each study participant was taken from their records. For controls, breast physical examination was conducted by oncology residents in order to select eligible controls. If the control was eligible for the study, interview was conducted by experienced nurses. At the end of each interview, blood specimen were collected from each control by experienced laboratory technologist and analyzed using SysmexKX – 21N hematology analyzer at TASH Laboratory.

Data analysis and management

Data analysis was done using SPSS Software, version 20. Then, descriptive analysis was made in order to assess the socio-demographic characteristics of cases and controls. Independent student t- test was used to compare the mean $\pm$ standard deviation of different hematological parameters among cases and controls. P value less than 0.05 were considered as statistically significant.

In order to assess presence of selected hematologic abnormalities, the reference range was taken from WHO and from the output of hematology analyzer. Regarding anemia, WHO 2011 hemoglobin (HB) concentration for the diagnosis of anemia and assessment of severity was used. As per this assessment, if HB concentration is $\geq 12\text{gm/dl}$, there is no anemia, mild anemia when HB is $10.9\text{-}11.0\text{gm/dl}$, moderate anemia when HB is $8.0\text{-}10.9\text{gm/dl}$ and severe anemia when HB is less than 8gm/dl . In addition, anemia was also further characterized as microcytic and macrocytic anemia based on MCV values. Similarly, anemia was also characterized as hypochromic and normochromic anemia, based on MCHC values based on the reference range of CBC SYSMEX KX – 21N. In addition, in order to characterize the level of leucocyte and platelet, the reference was based on the reference range established by the CBC SYSMEX KX – 21N hematology analyzer. Based on the analyzer, the reference range of WBC count was $3.7 - 10.4 \times 10^9/\text{L}$. When WBC count was less than the lower range ($3.7 \times 10^9/\text{L}$), it was characterized as leucopenia, whereas when the value was greater than the upper range ($10.4 \times 10^9/\text{L}$), it was characterized as leucocytosis. Regarding the platelet count, the established reference range was $163 - 337 \times 10^9/\text{L}$. Similarly, if the platelet count was less than the lower range ($140 \times 10^9/\text{L}$), it was characterized as thrombocytopenia, whereas when the value was greater than the upper range ($385 \times 10^9/\text{L}$), it was characterized as thrombocytosis.

Data Quality Control and Assurance

The data collection tools were prepared in English and translated to the local language in order to facilitate understanding of the study participants. The data collection tools were pretested on 5% of breast cancer patients not included in the study. Daily supervision was made on all questioners collected on each day. Regarding quality assurance of laboratory tests, collected specimens were analyzed on the same day of sample collection. Quality control samples were analyzed before testing actual patient samples, in order to check for the performance of testing reagent and hematology analyzer.

Ethical consideration

Ethical approval was obtained from the School of Public Health Research Ethical Review Committee, and it was also approved by Institutional Review Board of the College of Health Sciences of the Addis Ababa University. Written consent was obtained from each of the respondents after the purpose of the study was explained. During breast physical examination for screening of controls, participants who had breast mass were consulted by physicians and their results were given for free in order to get early diagnosis and treatment. Confidentiality and privacy was maintained throughout the study.

Results

Sociodemographic characteristics of study participants

In this study, a total of 230 breast cancer cases and 230 healthy controls participated. 70.9% of the cases and 75.7% of the controls were urban dwellers. The mean age of study participants were 42.83 ± 12.06 and 39.33 ± 11.14 years for cases and controls, respectively. More than half (54.3%) of cases and 62.2% controls were less than 40 years old (Table 1). By religion, 67.4% of cases and 59.1% of controls were followers of the Ethiopian Orthodox Church. Regarding marital status, 76.1% of cases and 67.4% of controls were married. However, nearly half (43.5%) of the cases were illiterate, while 30% of controls have attained secondary education. More than half (69.6%) of the cases and 43.1% of controls were housewives. Regarding income, even though limited number of study participants responded about their income, 37, (34.3%) of the cases had less than 1000 Ethiopian Birr per month. However, 47, (37%) of controls had more than 3000 Ethiopian Birr income per month (Table 1).

Hematologic profile of breast cancer cases and controls

Hemoglobin, Red Blood Cells platelet count and Packed Cell Volume

The overall mean values with standard deviation of Hemoglobin (HB), Red Blood cell (RBC), Packed Cell Volume (PCV), of cases were (13.1 ± 1.6 g/dl, $4.6 \pm 0.53 \times 10^{12}$ /L and 38.7 ± 4.5 %, respectively) and those values for controls were (14.0 ± 1.3 g/dl, $4.8 \pm 0.47 \times 10^{12}$ /L, 40.5 ± 3.5 % respectively (Table 2). On the other hand, mean platelet count for the cases and controls were ($323.4 \pm 108.1 \times 10^9$ /L) and ($282.0 \pm 70.0 \times 10^9$ /L) respectively. As indicated in table 2, the P value is < 0.05 for the above parameters.

Red cell indices

The overall MCV, MCH and MCHC values of the cases and controls were (84.3 ± 8.1 fl, 29.0 ± 4.2 pg, and 33.6 ± 1.7 %,) and (85.7 ± 6.0 fl, 29.5 ± 2.4 pg, 34.2 ± 2.5 %) respectively (Table 3). As indicated in table 3, there was significance difference of MCV and MCHC values of cases and controls, ($P < 0.05$). On the other hand, P value was 0.153 for MCH value.

Total WBC and WBC differential parameters

In this study, the mean value of total WBC was 7.1 ± 2.8 and $7.1 \pm 2.4 \times 10^9/L$ for cases and controls respectively, which did not show statistically significant difference ($P = 0.332$) between the two groups. The mean neutrophil, lymphocyte, monocyte and eosinophil counts ($55.19 \pm 13.96\%$, $29.67 \pm 11.21\%$, $10.14 \pm 5.54\%$, and $4.05 \pm 4.65\%$, respectively) of the cases were significantly higher than the controls ($36.39 \pm 19.27\%$, $24.58 \pm 8.40\%$, $5.51 \pm 2.08\%$, and $2.80 \pm 3.88\%$), respectively.

Characterization of some selected hematologic parameters

In this study, 20.4% of cases and 5.6 % of controls were anemic based on their hemoglobin value (Table). Based on severity of anemia, majority, 27 (11.7%) of cases and 4 (1.7%) controls were moderately anemic. On the other hand, 20, (8.7%) of cases and 8, (3.5%) of controls were mild anemic, ($P=0.0001$). (Table 4).

Out of the total anemic study participants, 20, (33.3%) of cases and 8 (13.3%) of controls were mild anemic. 27(45%) of cases and 4 (6.7%) of controls were moderately anemic and only one control (1.7%) were severely anemic.(Figure 1).

Regarding characterizing the anemia according to the size of red blood cell and hemoglobin concentration, microcytic anemia was found among 64 (28.2%) of the cases and 42, (18,4%) of controls. On the other hand, macrocytic anemia was found among 2 (0.9%) of cases and 3 (1.3%) of controls. Similarly, 15(6.6%) of cases and 8 (3.5%) of controls had hypochromic anemia. In addition, 23, (10.5%) of cases and 7, (3%) of controls were with normocytic anemia, 27, (11.7%) of cases and 9, (3.9%) of controls with normochromic anemia and 9, (3.9%) of cases and 4 (1.7%) of controls with microcytic hypochromic anemia (Table 4). Regarding their leucocyte, leucopenia is insignificant difference among cases and controls. Leucocytosis is also more or less similar. Similarly, thrombocytopenia is not observed among cases and controls. However, thrombocytosis was found among 54, (23.5%) of the cases and 18, (7.8%) of controls, ($P=0.0001$). (Table 4).

The finding also indicated that 16 (7.0%) of cases and 1 (0.4%) of controls were both anemic and with thrombocytosis, ($P=0.0001$). Similarly, (2.2%) of cases and only none (0.0%) of controls had the triple burden of anemia, leucocytosis and thrombocytosis. There was no significant difference among cases and controls for hypochromic anemia, microcytic hypochromic anemia and Leucopenia, $P>0.05$ (Table 4).

Discussion

Breast cancer is a major public health problem in both developed and developing countries. Its incidence is rapidly increasing (1-3). In general, different sociodemographic and hematologic characterizations are very important and should be considered in order to maximize treatment success and patient survival. In this study, the majority, 54.3 % of the study participants were less than 40 years of age. This finding is comparable with a study conducted on the prevalence of estrogen receptor-negative breast cancer patients in Ethiopia, where 35% of the study participants were between 30–39 years old (23). On the other hand, our finding is not comparable with a study conducted in Iraq which indicated that 58.4% of the

participants were found to be between 50 and 59 years (18). This difference could be due to lifestyle, diet, genetic, population characteristics of the countries and related factors.

Even though breast cancer occurrence is believed to be higher in above 50 years of age, in this study 15.2% of cases were found to be less than 30 years old, which is comparable with another study done in Ethiopia (23). However, this study is incomparable with a study done in India, which indicated that there is no breast cancer case in those less than 30 years of age; this difference could be due to life style, genetic factors and the population distribution of the country (19). In general, this study revealed that the majority, 76.5% of breast cancer cases were less than 50 years old. This finding is somehow comparable with study done in Pakistan, Sindh, which indicated that, 61.67% of the cases were less than 50 years (24).

Regarding educational status, majority, 43.3% of the cases were illiterate, which is lower than the study conducted in Sindh which indicated that 71.7% were illiterate; this difference could be due to smaller sample size and study setting (24). In general, large number, (34.3%), of cases as opposed to 12.6% of the controls had a monthly income of less than 1000 Ethiopian Birr. However, based on another study, the distribution of cancer was noted to be more on socioeconomically better individuals, presumably owing to lifestyle risks they are exposed to (25). Regarding marital status, majority, 76.1% of the cases were married. That appears to be comparable with studies conducted in different countries (6, 24).

Hematological parameters are tests which are routinely available, cost effective, standardized and provide valuable information regarding different types of diseases, including cancer (18). In this study, the mean hemoglobin, PCV, RBCs, values were significantly lower in patients compared to controls. This finding is comparable with studies conducted in Iraq (18), Nigeria (16), Sindh (Pakistan) (24).

Since HB and PCV are used as guides to diagnose anemia and anemia is one of the major problems for most of cancer patients, those parameters are usually lower compared to healthy controls (16, 24). This low level of hematological parameters may be associated with bone marrow suppression or immune suppression, as a result of the cancer itself, (26). The other possible reason could be if the patient condition were on pre or post-surgery, these parameters can be significantly reduced. In addition, nutritional status and clinical conditions of patients could also play the most important role in the reduction of such values (26, 27). Regarding red cell indices, the mean MCV and MCHC were significantly lower among cases, whereas the MCH was almost similar for cases and controls. This finding is comparable with study done in Nigeria (17). With the exception of MCH, it is also supported by a study done in India, which indicated that the overall mean MCV, MCH, MCHC of cases were lower than the controls (28).

The mean WBC value of the cases and controls was almost the same. The mean platelet count was significantly higher among patients than controls (323.4 ± 108.1 versus 282.0 ± 70.0). This finding is comparable with a similar study done in Nigeria, Lagos which revealed that mean platelet count was 291.5 ± 103.4 and 228.8 ± 75.6 for cases and controls, respectively (17). This study is also supported by a similar study conducted in India, which indicated that mean platelet count was higher among cases

compared with controls (14). This increment could be explained by the reactive thrombocytosis among most breast cancer patients as a result of cancer induced anemia. However, this finding is incomparable with similar study conducted in Iraq which indicated that the mean platelet and, WBC counts are significantly lower in cases than in controls (18). This difference could be due to small sample size, clinical characteristics, and demographic of differences of the study participants.

Regarding differential WBC count, there was a significantly higher mean value among cases compared with the controls. In this study, the mean neutrophil and lymphocyte count was $55.2 \pm 1.9\%$ and $29.6 \pm 11.2\%$ for cases and $36.4 \pm 19.3\%$ and $24.6 \pm 8.4\%$ for controls, respectively. This finding is comparable with a study conducted in Nigeria, which indicated a significantly higher mean value of neutrophil and lymphocytes counts, $54.8 \pm 13.1\%$, and $38.2 \pm 12.8\%$ for cases versus $44.4 \pm 8.9\%$, $8.8 \pm 16.0\%$ for controls, respectively (17). This increment could be explained by neoplasm of cancer cells.

A pretreatment anemia or leucocytosis can serve as a useful marker to predict outcome of cancer. In this study, it was observed that anemia was found in 20.4% of cases and 5.6% of controls, which is comparable with a study done in Tikur Anbessa Specialized Hospital among patients with solid tumor, where the prevalence of anemia was 23% (29). It is also similar with a study done among breast cancer patients in China, which indicated that 25.3% of patients were anemic before treatment (30).

In contrast to the current study, researchers from India reported that 60% of pre chemotherapy breast cancer patient were anemic (26). This difference could be due to smaller sample size of the later study, which were 51 cases and controls. It could be also due to the study setup, the background of the study participants, and the stage of the disease. This study also indicated that leukopenia was found in 5.7% of cases and 3.9% of controls, this nearly comparable with study done in India (31). Thrombocytosis was observed among 23.5% of the cases and 7.8% of controls. This study was nearly comparable with study done among pretreatment breast cancer patients were 18.2 % of the cases were with thrombocytosis (32). This difference could be due to difference in stage of disease and the study participants.

Limitation; since this study is a hospital based study; it may not be representative for the general population. However, in the absence of sufficient data in the country, this study from the only cancer treatment center of the country during the study period highlights the situation.

Conclusion And Recommendations

The study observed that most of the study participants were young and there were significant number of breast cancer cases even under the age of 30 years. In addition, nearly half, (43%) of breast cancer cases were illiterate, with low monthly income. Regarding hematologic profile, the mean hemoglobin, red blood cell count, packed cell volume, mean corpuscular volume; mean corpuscular hemoglobin concentration values were significantly lower among cases compared to controls. On the other hand, some hematological parameters like platelet count, neutrophil count, are significantly higher among controls. Anemia and thrombocytosis were observed as major hematologic abnormalities.

Since younger women were highly affected by breast cancer, attention should be given by concerned bodies for young population in every aspect of prevention and control activities of cancer in general and breast cancer in particular. Since this study may not provide representative evidence, it is important to conduct further studies with large sample size in order to confirm the findings of this study and design appropriate interventions.

Abbreviations

BC: Breast cancer; CT:,Computed Tomography; HB: Hemoglobin; HRT: Hormone Replacement Therapy; MCH: Mean Corpuscular hemoglobin; MCHC:Mean Corpuscular Hemoglobin Concentration; MCV: Mean Corpuscular Volume; NGO: Non-Governmental Organization; PCV: Packed Cell Volume; RBC: Red Blood Cell; SPH: School of Public Health; SPSS: Statistical Package for Social Sciences; TASH: Tikur Anbessa Specialized Hospital; WBC: White Blood Cell

Declarations

Ethics approval and consent to participate

- This study was approved by Institutional Review Board of College of Health Sciences of the Addis Ababa University. Informed written consent form was signed by the participants. Confidentiality was highly maintained throughout this study.

Consent for publication

- Study participants gave their written informed consent for publication. However in this manuscript data was not presented at individual level.

Availability of data and material

The datasets generated and/or analyzed during the current study are not publicly available due to individual privacy but are available from the corresponding author on reasonable request.

Conflict of Interests:

- All authors declare that there is no conflict of interests regarding the publication of this paper.

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Authors' Contribution:

- I state that this research was done by all authors indicated in this article. Fatuma Hassen, Prof. FikreEnkusilassie, Dr. Aster Tesegaye and Dr, MatiwosAssefaparticipated in the design, data

analyses, interpretation and preparation of manuscript. Ahmed Ali, Dr.Adamu Addisse and Dr.GirmaTaye also participated in data interpretation and preparation of this manuscript. Finally, all authors critically reviewed and approved the manuscript.

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References

1. WHO, Latest global cancer data international agency on cancer. 2018; (press release No 263)
2. Ferlay J, Soerjomataram I, Ervik M, Dikshit R, Eser S, Mathers C, Rebelo M, et.al. GLOBOCAN 2012, Cancer Incidence and Mortality Worldwide: 2013; 1.
3. American cancer society. Breast Cancer Overview: American Cancer Society, CDC, 2013.
4. Jemal A, Bray F, Forman D, Brien MO, Ferlay J, Center M, et.al. Cancer Burden in Africa and Opportunities for Prevention. Cancer 2012; 118 (18) 1-13.DOI: 10.1002/cncr.27410.
5. Lundqvist A, Andersson F, Ahlberg I, Nilbert A., Gerdtham U. Socioeconomic inequalities in breast cancer incidence and mortality in Europe: a systematic review and meta-analysis. The European Journal of Public Health. 2016; 26(5): 804–813.
6. Usama M. Al-Fadhli, Ameel F. Al-Shawi, Ahmed S. Al-Nuaimi. Assessment of sociodemographic characteristics in a sample of breast cancer patients in Baghdad. J Fac Med Baghdad. 2016; 58(4): 357-360
7. Alwan NA, Tawfeeq FN, , and Mallah Nawar A.G.. Demographic and clinical profiles of female patients diagnosed with breast cancer in Iraq. J Contemp Med Sci. 2019; 5 (1): 14–19.
8. Socio-Economic and Health Access Determinants of Breast and Cervical Cancer Screening in Low-Income Countries: Analysis of the World Health Survey. PLoS ONE. 2012; 7(11): e48834. doi: 10.1371/journal.pone.0048834.
9. Ibrahim NA, Oludara MA. Socio-demographic factors and reasons associated with delay in breast cancer presentation: Lagos State University College of Medicine Ikeja-Lagos, Nigeria, The Breast, 2012; 21(3): 416-418.
10. FMOH, Ethiopian cancer society, FMOH, 2015.
11. Abate SM, Yilma Z, Assefa M, Tigeneh W. Trends of Breast Cancer in Ethiopia. Int J Cancer Res MolMech, 2016; 2(1): doi <http://dx.doi.org/10.16966/2381-3318.121>.
12. Tadele, N. Evaluation of Quality of Life of Adult Cancer Patients Attending TikurAnbessa Specialized Referral Hospital, Addis Ababa Ethiopia. Ethiop J Health Sci. 2015; 25(1): 53–62.
13. Federal Ministry of Health Ethiopia, Disease Prevention and Control Directorate National Cancer Control Plan 2016-2020. 2015.

14. Varma M, Sahu A., Paneri and Kachhawa K. Study of BMI, Lipid Profile and CBC in Women having Breast Cancer, Sri Aurobindo Institute of Medical Sciences, Indore: India. *Journal of Pure and Applied Microbiology*. 2014; 8(6): 4827-4831.
15. Chen L, Kong X, Yan C, Fang Y, Wang J. The research progress on the prognostic value of the common hematological parameters in peripheral venous blood in breast cancer. *Oncotargets and Therapy*. 2020; 13: 1397-1412
16. Olufem AE, Oguntola OA, Adeoti S, Layiwola M, Akintola AA. Haematological Parameters in Female Breast Cancer Patients in South Western Nigeria. *J Med Health Sci*. 2013; 2(4): 398-401.
17. Akinbami A, Popoola A, Adediran A, Dosunmu A, Oshinaike O, Adebola P, et.al. Full blood count pattern of pre-chemotherapy breast cancer patients in Lagos, Nigeria. *Caspian J Intern Med*. 2013; 4(1): 574-579.
18. Ali L. Study effect of Breast Cancer on Some Hematological and Biochemical Parameters in Babylon Province Iraq. *Journal of Pharmacy and Biological Sciences (IOSR-JPBS)*. 2014; 9(3): 20-24. e-ISSN: 2278-3008, p-ISSN: 2319-7676.
19. Al Arif AA, Kumar A, Chigurupati S, Jawed M, Pandurangan T. Pre-treatment variations in hematological parameters of breast cancer patients. *International journal of pharmacy and pharmaceutical science*. 2018; 10(2): 157-161.
20. Berhe S, Sinshaw W, Hailu M, Abebe M, Aregay A. Assessment of Knowledge of Breast Cancer and Screening Methods among Nurses in University Hospitals in Addis Ababa, Ethiopia. *ISRN Oncology*. 2013; V 2013: 8 pages <http://dx.doi.org/10.1155/2013/470981>.
21. Mekonen M, Ali A, Firdu N. Assessment of Breast Self-examination Practice and associated factors among women between 20 up to 70 years attending on the selected public health centers, in Addis Ababa: Addis Ababa university college of health science, school of public health Ethiopia, 2015, unpublished thesis.
22. Ethiopian cancer Association, 2007.
23. Kantelhardt EJ, Assefa M, Abrha A, Tigeneh W, Jemal A, Vetter M, al. The prevalence of estrogen receptor-negative breast cancer in Ethiopia. *BMC Cancer*. 2014; 14: 895. <http://www.biomedcentral.com/1471-2407/14/895>.
24. Khan S. Study of some Hematological parameters as Biomarker for breast Cancer population of Sindh. *Sindh Univ. Res. Jour. (Sci. Ser.)*. 2017; 49(1): 23-28. <https://www.researchgate.net/publication/316917868>.
25. Amgiasvasanth AM, Patil PS. Profile of breast cancer patients attending a tertiary care centre, *Int J Community Med Public Health*. 2016; 3(3): 663-667, DOI: <http://dx.doi.org/10.18203/2394-040.ijcmph20160629>.
26. Maccio A, Madeddu C, Gramignano G, Mulas C, Tanca L, Cristina M al. The role of inflammation, iron, and nutritional status in cancer-related anemia: results of a large, prospective, observational study. *haematologica* 2015; 100 (1) 124 -132.

27. Ufelle SA, Ukaejiofo EO, Neboh EE, Achukwu PU, Ikekpeazu EJ, Maduka IC et.al. Some hematological parameters in pre and post surgery breast cancer patients in Enugu, Nigeria, *Int J Cur Bio Med*. 2012; 2(1) 188 -190.
28. Smita S. Masamatti¹, Vijaya C. Hematological parameters in pre chemotherapy breast cancer patients in a tertiary care centre: India, *IP Journal of Diagnostic Pathology and Oncology*, 201; 3 (3):237-240. DOI: 10.18231/2581-3706.2018.0049.
29. Kifle E, Hussein M, Alemu J, Tigneh W. Prevalence of anemia and associated factors among newly diagnosed patients with solid malignancy at TikurAnbessa hospital Radio therapy center: Addis Ababa Ethiopia, *Advances in hematology* 2019; V 2019:1 – 8. <http://doi.org/10.1155/201982/79789>,
30. Zhu W, Xu B. Association of Pretreatment Anemia with Pathological Response and Survival of Breast Cancer Patients Treated with Neoadjuvant Chemotherapy: A Population-Based Study: *PLOS One*. 2015; 10 (8):1-13. DOI:10.1371/journal.pone.0136268.
31. Bekha TS, Bhargava S. Preoperative biochemical, hematological and radiological parameters in breast cancer, case control study. *Journal of clinical and diagnostic research*. 2019; 13(3): 19-23.
32. Stradimou A, Ioannis A. Voutsakis. Pretreatment thrombocytosis as prognostic factors in metastatic breast cancer. *International journal of breast cancer*. 2013; V 2013: 1-6. [http: doi.org/10.1155/2013/289563](http://doi.org/10.1155/2013/289563).

Tables

Table 1. Sociodemographic characteristics of breast cancer cases and controls at TikurAnbessa Specialized Hospital, Addis Ababa, Ethiopia, 2019.

Variables	Cases		Controls	
Resident	Frequency	Percent	Frequency	Percent
Urban	163	70.9	174	75.7
Rural	67	29.1	56	24.3
Age group (years)				
<40	125	54.3	143	62.2
40 and above	105	45.7	87	37.8
Religion				
Orthodox	155	67.4	136	59.1
Muslim	38	16.5	57	24.8
Protestant	36	15.7	35	15.2
Other	1	0.4	2	0.9
Marital status				
Single	23	10.0	29	12.6
Married	175	76.1	155	67.4
Divorced/widowed	32	13.9	46	20.0
Education level				
Illiterate	100	43.5	34	14.8
Read and write	26	11.3	9	3.9
Primary education	33	14.3	56	24.3
Secondary education	45	19.6	69	30.0
College and University	26	11.3	62	27.0
Occupation				
House wife	160	69.6	99	43.1
Government employee	34	14.8	70	30.4
Private	28	12.1	42	18.2
Other	8	3.5	19	8.3
Income)	(N=108)		(N=127)	

< 1000	37	34.3	16	12.6
1000 -2000	32	29.6	37	29.1
2001-3000	10	9.3	27	21.3
Greater than 3000	29	26.9	47	37.0

Table 2. HB, RBC, platelet count and PCV parameters of cases and controls at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia, 2019

Parameter	Cases	Controls	P – Value
HB (Mean $\pm$ SD) g/dl	13.1 $\pm$ 1.6	14.0$\pm$ 1.3	0.0001
Minimum Hb	8.7	7.3	
Maximum Hb	16.4	20.1	
RBC (Mean $\pm$ SD) x 10¹²/L	4.6$\pm$ 0.54	4.8$\pm$0.47	0.020
Minimum RBC	2.84	3.39	
Maximum RBC	6.18	7.12	
Platelet (Mean $\pm$ SD) x 10⁹L	323. 4$\pm$ 108.1	282.0$\pm$70.0	0.0001
Minimum Platlet	110.0	119.0	
Maximum Platlet	827.0	469.0	
PCV (Mean $\pm$ SD) %	38.7$\pm$ 4.5	40.5 $\pm$ 3.5	0.0001
Minimum PCV	26.20	24.80	
Maximum PCV	49.20	58.40	

HB = Hemoglobin, PCV= Packed cell volume, WBC= White blood cell.

Table 3: Red cell indices values in breast cancer cases and controls at Tikur Anbessa Specialized Hospital, Addis Ababa, Ethiopia, 2019.

Red cell indices parameters	Cases	Controls	P- value
MCV, fl (Mean $\pm$ SD)	84.3 + 8.1	85.7 +6.0	0.042
Minimum MCV	65.6	62.4	
Maximum MCV	105.9	111.5	
MCH, pg (Mean $\pm$ SD)	29.0 + 4.2	29.5+2.4	0.153
Minimum MCH	21.2	19.3	
Maximum MCH	37.5	39.2	
MCHC, gm/dl (Mean $\pm$ SD)	33.7 + 1.7	34.2 + 2.5	0.005
Minimum MCHC	22.4	29.4	
Maximum MCHC	38.5	36.6	

Key= *MCV* = Mean Cell Volume *MCH*= Mean Cell Hemoglobin, *MCHC*= Mean Cell Hemoglobin Concentration

Table 4: Distribution of abnormal hemoglobin, leucocyte and platelet values between breast cancer cases and controls atTikurAnbessa Specialized Hospital, Addis Ababa, Ethiopia, 2019.

Parameters	Cases		Controls		P - value
Hemoglobin (gm/dl)	N	%	N	%	
12 and above (No anemia)	183	79.6	217	94.3	
Mild anemia	20	8.7	8	3.5	0.0001
Moderate anemia	27	11.7	4	1.7	
Severe anemia	0	0	1	0.4	
Microcytic anemia	64	28.2	42	18.4	
Macrocytic anemia	2	0.9	3	1.3	0.046
Hypochromic anemia	15	6.6	8	3.5	0.134
Normocytic anemia	23	10.0	7	3.0	0.003
Normochromic anemia	27	11.7	9	3.9	0.002
Microcytic Hypochromic	9	3.9	4	1.7	0.159
Leucopenia	13	5.7	9	3.9	0.681
Normal	198	86.1	202	87.8	
Lecucytosis	19	8.3	19	8.3	
Thrombocytopenia	4	1.7	5	2.2	
Normal	172	74.8	207	90	0.0001
Thrombocytosis	54	23.5	18	7.8	
Both anemic and thrombocytosis	16	7.0	1	0.4	0.0001
Both anemic , thrombocytosis and lecucytosis	5	2.2	0	0.0	0.025

****The reference range is based on the WHO classification of anemia. Regarding leucocyte and platelet, the reference range is based on the established range of the CBC Sysmex KX – 21N hematology analyzer***

****Anemia, When HB<12gm/dl, (Mild anemia when HB is 10.9-11.0 gm/dl, Moderate anemia when HB is 8.0-10.9 gm/dl, and Severe anemia when HB is <8 gm/dl)***

**** Lecucytosis: when total WBC count is >10.4 x 10⁹/L, Leucopenia: when total WBC count is < 3.7 x 10⁹/L***

****Thrombocytopenia: when total plateletcount is <140 x 10⁹/L, Thrombocytosis: when total platelet count is 385x 10⁹/L***

****Microcytic anemia: MCV< 82fl, Macrocytic anemia: MCV > 99fl, Hypochromic anemia: MCHC: <32 mg/dl***

Figures

***Classification of Anemia: When $HB < 12 \text{ gm/dl}$, (Mild anemia when HB is $10.9-11.0 \text{ gm/dl}$, Moderate anemia when HB is $8.0-10.9 \text{ gm/dl}$, and Severe anemia when HB is $< 8 \text{ gm/dl}$)**

Figure 1

Severity of of anemia among breast cancer cases and controls at Tikur Anbessa Specialized Hospital, Addis Ababa, 2019.(n=60)

Supplementary Files

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