## Relationship Between Age and Cancer Among Women at the National Cancer Control Foundation in Ibb City, Yemen, 2024

**Abstract:**

**Introduction**: Cancer is one of main causes of death among women around the world, affecting into both high-income and middle-income countries. **Aim of study**: is to assess the relationship between cancer and age group among female participants. **Methods**: A cross-sectional study was conducted with female cancer patients at the National Cancer Control Foundation (NCCF) in Ibb governorate, Yemen. **Results**: A total of 134 female cancer patients were recruited for this study. The patients' ages ranged from 18 to 80 years with a mean age of 42.66 ± 21.0 years. Most of female patients (n = 102; 76.12%) were from rural areas. Four types of cancer were most common in females including cancers of breast (n = 40; 29.85%), colorectal (n = 11; 8.2 %), uterine (n = 10; 7.46%), and lymphoma (n = 7; 6.72%). Around two thirds of cancers (n=65; 41.8%) were among females aged from 41-60 years, while in other age groups; less than 18 years, 19-41 years old, and over 60 years, the cancer was estimated at (n=24; 17.9%, n=34; 25.4%, n= 20; 14.9% respectively). **Conclusion**: The prevalence of cancer was breast cancer, and highest incidence of cancer was observed among females from rural area, low education level, and among age group 41–60 years.

**Keywords**: Cancer, Age, Female, deaths

**Introduction**:

Cancer is a leading cause of death worldwide among women in both high-income countries and middle-income countries [1]. The cancer burden is also expanding in countries of all income levels due to the growth and aging of the population [2]. The increasing of cancer burden is expected to be particularly announced in low- and middle-income countries (LMICs), where the average life expectancy is becoming longer due to public health development such as the control of infectious diseases and reductions in maternal, infant, and childhood mortality [3.4].

All the studies of cancer epidemiology used age as defined by units of time as one of the most risk factor for cancer [5,6]. Some studies showed that cancer increase occur with age [7,8]. Also, cancer is considered an age-related disease, increases rapidly in midlife, and a complex biological process associated with aging [10]. The adult people with the longest longevity are less likely to develop cancer [11]. So, age is not considered as pathogenic disease, but it is as a natural process, and progress in age does not necessarily lead to cancer [12].

In Yemen, 16,476 infected cases and 12,103 deaths of new cancers were recorded in 2020 (76.5 per 100,000) [13]. Oncology report in 2021 revealed that the most common ten cancers in Yemen are Breast cancer, Leukemia, Colorectal, Lymphoma, Head and Neck, Gastric, Thyroid, Brain and CNS, ovarian and Prostate cancers [14]. The convergence between females and males was (76.1 vs 77.9 per 100,000) for incidence cases, and 5667 vs 6436 in deaths, respectively) in Yemen [14]. The aim of this study is to assess the relationship between cancer and age group among female participants.

**Methodolody**

**Study design and sample**

A cross-sectional study was conducted with female cancer patients at the National Cancer Control Foundation (NCCF) in Ibb governorate, Yemen. The study duration was from October 3, 2023 to January 15, 2024.

**Inclusion and exclusion criteria**

The criteria include selecting sample were patient female over the age of 18, and attend the national cancer center at Ibb, Governorate, Yemen. While the exclude criteria were females who unable to communicate and with hearing barriers, mentally illness and those who did not accept to participate or did not complete the interview.

**Instrument of the Study**

The questionnaire sheet was designed by the researchers and co-researchers based on deep reviews of relevant literatures. Checklist of questions included the female sociodemographic characteristics; age, marital status, education level, job before cancer and type of cancer [15]. Co-researchers used the center database records to identify diagnosis and type of cancer.

**Data Collection**:

In the beginning, co-researchers explained the objectives of the study for the female participants before collecting data. All participants were informed that they have the right to withdraw from the study at any time during interviews. Individual interview was conducted in separated room for the purpose of privacy and confidentiality of participants.

**Statistical Analysis**:

Data were analyzed using excel sheet 2018. Descriptive statistics such as frequency, percentage, mean, and standard deviation were employed to summarize various characteristics of participants.

**Results:**

**Sociodemographic Characteristics.**

A total of 134 female cancer patients were recruited for this study. Their age ranged from 18 to 80 years with a mean age of 42.66 ± 21.0 years. Two fifths of the female patients (n = 56; 41.79%) had age between 41-80 years. Regarding residency, most of female patients (n = 102; 76.12%) were from rural areas, while (n = 32; 23.88%) were from urban areas. Majority of the female patients (n = 117; 87.31%) were married, whereas only (n = 14; 10.45%) were unmarried. Concerning education level, around two-thirds of patients (n = 90; 67.16%) were illiterate, while (n = 33; 24.6%) have completed primary education. See Table (1)

**Table 1. Sociodemographic Characteristics of Female Patients with Cancer at the NCCF, Ibb Governorate, Yemen, 2024 (n = 134).**

|  |  |  |
| --- | --- | --- |
| Characteristics of participants (n=134) | Subgroups | Frequency (%) |
| Age | <18 | 24 (17.86) |
|  | 19-40 | 34 (25.37) |
|  | 41-60 | 56 (41.79) |
|  | >60 | 20 (14.93) |
| Residence | Urban | 32 (23.88) |
|  | Rural | 102 (76.12) |
| Marital status | Unmarried | 14 (10.45) |
|  | Married | 117 (87.31) |
| ` | Widowed/divorced/separated | 3 (2.24) |
| Level of Education | Illiterate | 90 (67.16) |
|  | Primary education | 33 (24.6) |
|  | Secondary school. | 8 (6.0) |
|  | University degree | 3 (2.24) |
| Employment Status | Yes | 96(71.6) |
|  | No | 38(28.4) |

**Distribution of the Most Common Cancer Types Among Female Participants**

Table (2) represents the top types of cancer among female participants. It was clear that ten types of cancer are more common among participant females; four of them are the most common in females including cancers of breast (n = 40; 29.85%), colorectal (n = 11; 8.2 %), uterine (n = 10; 7.46%), and lymphoma (n = 7; 6.72%).

**Table 2.** **The Top Types of Cancer Among Female Participant Patients** **at the NCCF, Ibb Governorate, Yemen, 2024 (n = 134).**

|  |  |  |
| --- | --- | --- |
| Type of cancer | Frequency | % |
| Breast Cancer | 40 | 29.85 |
| Colorectal Cancer | 11 | 8.21 |
| Uterine Cancer | 10 | 7.46 |
| Lymphoma | 9 | 6.72 |
| Ovarian Cancer | 7 | 5.22 |
| Gastric Cancer | 7 | 5.22 |
| Brain Cancer | 6 | 4.48 |
| Leukemia | 6 | 4.48 |
| Esophageal Cancer | 6 | 4.48 |
| Bone and Joint Cancer | 5 | 3.73 |
| Other Cancers | 27 | 20.15 |
| Total | **134** | **100** |

**Distribution of cancer among female participants according to their age groups.**

Table 3, showed the distribution of cancers among females according to their age groups. It was noted that more than one third of cancers (49; 36.6%) were among females aged from 41-60 years, comparted to other age groups; less than 18 years, 19-41 years old, and over 60 years (n=16; 11.9%, n=28; 20.9%, n= 14; 10.5% respectively).

**Table 3. Distribution of Cancer Among Female Participants According to their Age Groups at the NCCF, Ibb Governorate, Yemen, 2024 (n = 134).**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Cancer type** | **Age Groups** | | | |
| <18 | 19-40 | 41-60 | >60 |
| (no / %) | (no / %) | (no / %) | (no / %) |
| **Esophageal Cancer** | 0 | 2 | 0 | 4 |
| 0. 0.0% | 33.3% | 0.0% | 66.7% |
| **Lymphoma** | 4 | 2 | 1 | 2 |
| 44.4% | 22.2% | 11.1% | 22.2% |
| **Breast Cancer** | 0 | 14 | 26 | 0 |
| 0.0% | 35.0% | 65.0% | 0.0% |
| **Colorectal Cancer** | 1 | 1 | 5 | 4 |
| 9.1% | 9.1% | 45.5% | 36.4% |
| **Gastric Cancer** | 1 | 2 | 3 | 1 |
| 14.3% | 28.6% | 42.9% | 14.3% |
| **Uterine Cancer** | 0 | 2 | 5 | 2 |
| 0.0% | 22.2% | 55.6% | 22.2% |
| **Ovarian Cancer** | 0 | 3 | 3 | 1 |
| 0.0% | 42.9% | 42.9% | 14.3% |
| **Leukemia** | 4 | 1 | 1 | 0 |
| 66.7% | 16.7% | 16.7% | 0.0% |
| **Bone and Joint Cancer** | 4 | 0 | 1 | 0 |
| 80.0% | 0.0% | 20.0% | 0.0% |
| **Brain Cancer** | 2 | 1 | 3 | 0 |
| 33.3% | 16.7% | 50.0% | 0.0% |
| **Total** | 16 | 28 | 49 | 14 |
| 11.9% | 20.9% | 36.6% | 10.5% |

**Discussions:**

This study was conducted with 134 females with cancer at National Cancer Control Foundation (NCCF) in Ibb Governorate, Yemen. Its findings showed the sociodemographic features of females; the age range of participants, for example, was 18 to 80 years, with a mean age of 42.66 ± 21.0 years. This result was in line with regional data about prevalent of breast cancer, revealing that most Yemeni women are affected in the same age group [13,14,16]. Around more than three quarters of female participants (76.12%) resided in rural areas. This result was consistent with Yemen's demographic distribution, where a large portion of the population lives in rural areas [17]. Access to healthcare services in these areas is often limited, potentially leading to delayed diagnoses and treatment. Similar challenges have been observed in other Arab countries, where rural populations face barriers to cancer care due to infrastructural and socioeconomic factors [18].

Concerning the marital status, data revealed that majority of the female patients (87.31%) were married. This finding concords with the cultural norms in Yemen and many Arab countries, where marriage is prevalent among adult women [19]. The role of marital status in cancer occurrence and outcomes is complex; some studies suggest that married individuals may have better support systems, potentially leading to earlier detection and improved adherence to treatment [20,21].

Regarding educational level, data analysis indicated that about two thirds of female participants (67.16%) were illiterate, and around one quarter (24.65) had only primary education because the majority of female participants lived in rural areas. Many studies reported that the literate females infected with cancer were a concern, as they can understand disease processes, treatment options, and the importance of early detection measures [22,23]. Previous studies results were not similar to the results of this study in Yemen; but other studies in the Middle East and North Africa (MENA) region have reported similar findings, highlighting the need for targeted educational interventions to improve health education and cancer outcomes [24].

Regarding the most common cancer types, this study's findings revealed that four cancer types were most frequently diagnosed among female participants; more than one quarter (29.8%) of female patients were diagnosed with breast cancer, 8.2% were affected by colorectal cancer, 7.46% of them had uterine cancer, and lymphoma (6.72%). These results highlight the significant burden of breast cancer among Yemeni women, which aligns with global and regional epidemiological patterns [16,25]. In Yemen and other Arab countries, breast cancer remains the leading malignancy among women, with a high proportion of late-stage diagnoses due to limited screening programs and awareness [26,27]. Colorectal cancer, while less common than breast cancer, is increasingly being reported in younger populations, potentially due to dietary changes, genetic predisposition, and lifestyle factors [28]. Uterine cancer prevalence reflects the influence of reproductive health factors, including hormonal imbalances and obesity, which are known as risk factors [29]. Lymphoma, though relatively less common, is of concern due to its association with infections as prevalent in Yemen [30].

The current study findings indicate that cancer prevalence varies across different age groups, with the highest rate among women aged 41–60 years (36.6%). This result corresponded with global and regional studies, which have identified middle-aged women (40–60 years) as the most affected group by cancers such as breast, colorectal, and gynecological malignancies [31,32]. In Yemen, late-stage diagnosis was common due to low screening rates and limited healthcare accessibility, particularly in rural areas [33,34]. The relatively lower prevalence of cancer in among young females (under 18 and 19–41 years) suggests that genetic predisposition and environmental risk factors play role compared to older women [35]. Also, exposing patients to carcinogens and hormonal changes increases the likelihood of cancer development, particular in females [36]. The decline of cancer incidence among women over 60 years was due to underreporting, misdiagnosis, or lack of access of the old people to screening, particularly in Yemen [37].

**Conclusion:**

This study highlights the relationship between sociodemographic characteristics and female cancer patients. findings showed that the majority of participants were from rural areas and of low education levels. The most prevalent cancer was breast cancer, which reflects the global patterns. The highest incidence of cancer was observed among females from rural area, low education level, and among age group 41–60 years

**Recommendations:**

1. Public health strategies should be developed by the Ministry of Health in Yemen to improve cancer awareness among population, particularly in rural areas.
2. Healthcare staff in rural areas should be trained in screening, early detection, diagnosing cancer and referring patients to specialist doctors.
3. Future researches should be conducted to investigate other contributing factors to cancer.
4. Regular screening program should be achieved on a priority group as 41–60-year-old to detect cases and early treatment.
5. Healthcare staff should be trained to know signs and symptoms of female cancer, and educated about the benefits of the national screening programmes.
6. Encouraging cancer patients to adopt the guidelines of the National Cancer Control Foundation (NCCF).

**Limitation**

1. The culture and religion were barriers to involve more female participants.
2. To conduct the study with women, agreement was needed in Yemen.
3. This study focuses only on age groups, so future research should include other risk factors.

Ethical Approval and consent

Ethical approval was granted by the Ethical Committee of the Medical and Health Sciences at Jiblah University for Medical and Health Sciences, Yemen (Reference no: Nur.grad.10.9.2024). Ethics approval was also signed by the Ethical Committee National Cancer Control Foundation (NCCF) in Ibb governorate, Yemen, and written consent was obtained from all female participants who agreed to participate in the study.

Disclaimer (Artificial intelligence)

Author(s) hereby declare that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during the writing or editing of this manuscript.

**References:**

1. **Torre, Lindsey A., et al.** "Global cancer in women: burden and trends." Cancer epidemiology, biomarkers & prevention 26.4 (2017): 444-457.‏ <https://doi.org/10.1158/1055-9965.EPI-16-0858>
2. **Soerjomataram, Isabelle, and Freddie Bray**. "Planning for tomorrow: global cancer incidence and the role of prevention 2020–2070." Nature reviews Clinical oncology 18.10 (2021): 663-672.‏ <https://doi.org/10.1038/s41571-021-00514-z>
3. **Knaul, Felicia Marie, et al.** "Avoidable mortality: The core of the global cancer divide." Journal of global oncology 4 (2018): 1-12.‏ <https://doi.org/10.1200/JGO.17.00190>
4. **Pesec, Madeline, and Tracy Sherertz**. "Global health from a cancer care perspective." Future Oncology 11.15 (2015): 2235-2245.‏ <https://doi.org/10.2217/fon.15.142>
5. **Pfeiffer, Ruth M., et al**. "Proportion of US trends in breast cancer incidence attributable to long-term changes in risk factor distributions." Cancer Epidemiology, Biomarkers & Prevention 27.10 (2018): 1214-1222.‏ doi: 10.1158/1055-9965.EPI-18-0098
6. **Wang, Baohua, et al.** "Cancer incidence and mortality and risk factors in member countries of the" Belt and Road" initiative." BMC cancer 22.1 (2022): 582.‏ https://doi.org/10.1186/s12885-022-09657-3
7. **Fidler, Miranda M., et al.** "Cancer incidence and mortality among young adults aged 20–39 years worldwide in 2012: a population-based study." The lancet oncology 18.12 (2017): 1579-1589.‏ http://dx.doi.org/10.1016/ S1470-2045(17)30677-0
8. **DeSantis, Carol E., et al.** "Cancer statistics for adults aged 85 years and older, 2019." CA: a cancer journal for clinicians 69.6 (2019): 452-467.‏ doi: 10.3322/caac.21577.
9. **Laconi, Ezio, Fabio Marongiu, and James DeGregori**. "Cancer as a disease of old age: changing mutational and microenvironmental landscapes." British journal of cancer 122.7 (2020): 943-952.‏ https://doi.org/10.1038/s41416-019-0721-1
10. **Berben, Lieze, et al.** "Cancer and aging: two tightly interconnected biological processes." Cancers 13.6 (2021): 1400.‏ https://doi.org/10.3390/cancers13061400
11. **Chmielewski, Piotr Paweł.** "The association between body height and longevity: evidence from a national population sample." Folia Morphologica 83.1 (2024): 139-145.‏ DOI: 10.5603/FM.a2023.0005
12. **Franceschi, Claudio, et al.** "The continuum of aging and age-related diseases: common mechanisms but different rates." Frontiers in medicine 5 (2018): 61.‏ doi: 10.3389/fmed.2018.00061
13. **Ibrahim, A., El Baldi, M., Mohammed, S. et al.** Cancer statistics in Yemen: incidence and mortality, in 2020. BMC Public Health 24, 962 (2024). https://doi.org/10.1186/s12889-024-18207-4.‏
14. **Almansoub, Hasan AMM, et al.** "Pattern and Distribution of Cancer Cases in Marib, Yemen, during 2022/2023." *المجلة العلمية-جامعة إقليم سبأ* 6.2 (2024).‏ DOI: https://doi.org/10.54582/TSJ.2.2.76
15. **Sarkar, Sinjini, et al.** "Sociodemographic factors and clinical presentation of women attending Cancer Detection Centre, Kolkata for breast examination." *Journal of Clinical and Translational Research* 5.3 (2020): 132.‏ DOI: http://dx.doi.org/10.18053/jctres.05.202003.005
16. **Ali, Boshra, et al.** "Factors related to knowledge, attitudes, and behaviors regarding cervical cancer among Yemeni women." BMC cancer 24.1 (2024): 695.‏ doi: 10.1186/s12885-024-12435-y
17. **Garber, Kent, et al**. "Estimating access to health care in Yemen, a complex humanitarian emergency setting: a descriptive applied geospatial analysis." *The Lancet Global Health* 8.11 (2020): e1435-e1443.‏ Lancet Glob Health 2020; 8: e1435–43
18. **Mahdi, Hala, et al.** "Cancer burden among Arab-world females in 2020: Working toward improving outcomes." JCO Global Oncology 8 (2022): e2100415.‏ <https://doi.org/10.1200/GO.21.00415>
19. **Boah, Michael, Martin Nyaaba Adokiya, and Dalia Hyzam**. "Prevalence and factors associated with the utilisation of modern contraceptive methods among married women of childbearing age in Yemen: a secondary analysis of national survey data." *BMJ open* 13.6 (2023): e071936.‏ <https://doi.org/10.1136/bmjopen-2023-071936>
20. **Krajc, Kaja, et al.** "Marital status and survival in cancer patients: a systematic review and meta‐analysis." Cancer Medicine 12.2 (2023): 1685-1708. DOI: 10.1002/cam4.5003 ‏
21. **Chen Z, Yang K, Zhang Y, et al**. Assessment of Modifiable Factors for the Association of Marital Status With Cancer-Specific Survival. JAMA Netw Open. 2021;4(5):e2111813. doi:10.1001/jamanetworkopen.2021.11813
22. **Scott, Emily CS, and Peter J. Hoskin**. "Health inequalities in cancer care: a literature review of pathways to diagnosis in the United Kingdom." *EClinicalmedicine* 76 (2024).‏ [https://doi.org/10. 1016/j.eclinm.2024. 102864](https://doi.org/10.%201016/j.eclinm.2024.%20102864)
23. **Berkman, Nancy D., et al.** "Literacy and health outcomes: summary." AHRQ evidence report summaries (2004).‏ doi:10.2196/17430
24. **Mahdi, Hala, et al.** "Cancer burden among Arab-world females in 2020: Working toward improving outcomes." JCO Global Oncology 8 (2022): e2100415.‏ https://doi.org/10.1200/GO.21.00415
25. **Safiri, S., Noori, M., Nejadghaderi, S. et al.** Burden of female breast cancer in the Middle East and North Africa region, 1990–2019. Arch Public Health 80, 168 (2022). <https://doi.org/10.1186/s13690-022-00918-y>
26. **Rajesh, Sharma, et al.** "Temporal patterns of cancer burden in Asia, 1990–2019: a systematic examination for the Global Burden of Disease 2019 study." (2024).‏ [https://doi.org/10. 1016/j.lansea.2023. 100333](https://doi.org/10.%201016/j.lansea.2023.%20100333)
27. **Al Ajmi, Adil Aljarrah, et al.** "Challenges with the Management of Young Women’s Breast Cancer in Gulf Countries and the Middle East." Journal of Young Womens Breast Cancer and Health 1.1&2 (2024): 36-41.‏ DOI: 10.4103/YWBC.YWBC\_14\_24
28. A**l-Mansour M, Al-Mansoob M, Al-Maweri A, Al-Selwi A, Al-Mawri W**. Cancer statistics in Yemen: incidence and mortality, 2020. BMC Public Health. 2024;24(1):18207. <https://doi.org/10.1186/s12889-024-18207-4>
29. **Wong, Martin CS, et al.** "Prevalence and risk factors of colorectal cancer in Asia." *Intestinal research* 17.3 (2019): 317-329.‏ doi: 10.5217/ir.2019.00021
30. **Fernandes, Queenie, et al.** "Human papillomaviruses-related cancers: an update on the presence and prevention strategies in the Middle East and North African regions." Pathogens 11.11 (2022): 1380.‏ <https://doi.org/10.3390/pathogens11111380>
31. **Battah, Mohammed Mohammed, et al.** "Evaluation of clinicians’ knowledge and practice regarding pharmacotherapy of Non-Hodgkin’s lymphoma: A multi-center study in Yemen." Plos one 19.6 (2024): e0304209.‏ 9. <https://doi.org/10.1371/journal.pone.0304209>
32. **Pertyńska-Marczewska, Magdalena, and Tomasz Pertyński**. "Postmenopausal women in gynecological care." Menopause Review/Przegląd Menopauzalny 20.2 (2021): 88-98.‏ DOI: <https://doi.org/10.5114/pm.2021.107103>
33. **Dominguez-Valentin, Mev, et al.** "Cancer risks by gene, age, and gender in 6350 carriers of pathogenic mismatch repair variants: findings from the Prospective Lynch Syndrome Database." Genetics in Medicine 22.1 (2020): 15-25.‏ <https://doi.org/10.1038/s41436-019-0596-9>
34. **Mansour, Razan, et al.** "Systemic Barriers to Optimal Cancer Care in Resource-Limited Countries: Jordanian Healthcare as an Example." Cancers 16.6 (2024): 1117.‏ <https://doi.org/10.3390/cancers16061117>
35. **Coughlin, Steven S.** "Epidemiology of breast cancer in women." *Breast Cancer Metastasis and Drug Resistance: Challenges and Progress* (2019): 9-29.‏‏ <https://doi.org/10.1007/978-3-030-20301-6_2>
36. **Jeon, Jihyoun, et al.** "Determining risk of colorectal cancer and starting age of screening based on lifestyle, environmental, and genetic factors." Gastroenterology 154.8 (2018): 2152-2164.‏ <https://doi.org/10.1053/j.gastro.2018.02.021>
37. Troisi, Rebecca, et al. "The role of pregnancy, perinatal factors and hormones in maternal cancer risk: a review of the evidence." Journal of internal medicine 283.5 (2018): 430-445.‏ doi: 10.1111/joim.12747