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Community-Based Sociodemographic Determinants of Chemotherapy Response in Breast Cancer: A Retrospective Study from Central Java, Indonesia

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ABSTRACT

Introduction: Breast cancer remains a major global health concern, with disparities in treatment outcomes often rooted in social inequalities. Sociodemographic factors such as education, economic status, social support, and healthcare access play critical roles in influencing how patients respond to neoadjuvant chemotherapy (NAC). Understanding these determinants is essential for designing effective, community-based health promotion strategies that address health disparities. This study aimed to examine the influence of sociodemographic factors on breast cancer patients' response to NAC and to explore implications for community health promotion.
Methods: A retrospective quantitative study was conducted on 144 breast cancer patients who received NAC at PKU Muhammadiyah Hospital Gombong, a secondary-level healthcare facility in Central Java, Indonesia. Statistical analyses were performed using SPSS version 28. Data on education level, economic status, social support (assessed via the MOS Social Support Survey), and healthcare access (measured by distance to facility) were collected. Treatment responses were categorized as complete, partial, or progressive. Statistical analysis involved chi-square, Mann-Whitney U, and multinomial logistic regression to determine significant predictors of response. Patients with lower education levels were 2.50 times more likely to have a partial response (p = 0.031) and 4.20 times more likely to experience a progressive response (p = 0.004).
Results: Low economic status increased the likelihood of partial (OR = 3.30, p = 0.003) and progressive responses (OR = 6.40, p = 0.001). Each additional kilometre from a healthcare facility raised the risk of partial (OR = 1.20, p = 0.002) and progressive responses (OR = 1.50, p = 0.001). Higher social support decreased the odds of progressive response by 30% (OR = 0.70, p < 0.001). Social inequalities—particularly related to education, income, distance to care, and social support—significantly affect treatment response among breast cancer patients undergoing NAC.
Conclusion: This study fills a gap in the existing literature by utilizing real-world, community-based data to examine chemotherapy response through a health equity lens, moving beyond biologically centered models. It contributes theoretically by aligning findings with the social determinants of health framework, offering insights into structural disparities in cancer care. These findings emphasize the urgent need for integrated health promotion interventions aimed at improving health literacy, strengthening community support systems, and reducing structural barriers to care. Empowering underserved populations through community-based strategies is essential for equitable cancer outcomes.

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INTRODUCTION

Breast cancer is one of the most prevalent types of cancer in the world, especially among women. Neoadjuvant chemotherapy (NAC) is often used as one of the therapeutic modalities to shrink tumors before surgery, increase the likelihood of conservative surgery, and directly evaluate the therapy response (1). However, the success of neoadjuvant chemotherapy does not only depend on the biological characteristics of the tumor but is also influenced by sociodemographic factors such as education level, economic status, access to healthcare services, and social support. In communities with limited access to healthcare, the response to NAC tends to be lower compared to communities with better access (2,3). This indicates the presence of disparities that could potentially worsen patient prognosis, especially in areas with high poverty and low education levels (4,5).

Previous research has primarily focused on biological factors, such as molecular subtypes of breast cancer, to predict responses to chemotherapy. However, studies analyzing the impact of sociodemographic factors on the success of chemotherapy are still limited, particularly in communities with diverse access to healthcare services (6,7). Additionally, community-based retrospective data have not been extensively used to explore the relationship between sociodemographic conditions and chemotherapy outcomes (8,9). This study adopts a novel methodological approach by utilizing community-level data from real-world settings rather than from specialized oncology centers thus capturing the lived experiences and systemic barriers faced by patients in under-resourced areas. Epistemologically, it departs from a purely biomedical lens and embraces a health equity perspective grounded in the social determinants of health. By situating clinical outcomes within broader sociostructural contexts, this research extends current knowledge and provides actionable insights for health promotion strategies in similar low-resource environments. This research is necessary to identify non-biological factors that can be intervened upon to improve the success of breast cancer therapy.

This study combines a retrospective approach with a focus on sociodemographic factors to evaluate their influence on NAC response. This study is also unique because it is based on community data, which represents real conditions on the ground, not just data from tertiary health centers. This approach is expected to provide a more holistic understanding of disparities in NAC therapy outcomes and serve as a basis for community-based interventions. The retrospective design was chosen due to its efficiency in accessing existing clinical and sociodemographic data without disrupting ongoing care. This approach allowed us to analyze real-world conditions with minimal resource burden, which is particularly important in settings with limited research infrastructure. The use of community-based data was also intentional to provide a more representative picture of breast cancer treatment disparities across different levels of access and socioeconomic conditions. Unlike hospital-based datasets that tend to reflect patients with better access to specialized care, community-level data capture a broader spectrum of lived realities, including underserved and rural populations, making the findings more relevant for equitable health promotion planning. The purpose of this research is to examine the influence of sociodemographic factors on breast cancer patients' response to NAC and to explore implications for community health promotion.

METHOD

This study employ a clear and systematic approach to ensure the reliability and validity of the findings. Below are the components of the methodology:

Research Type

This study uses a community-based retrospective design. A retrospective design was selected for its practicality in utilizing existing medical records and structured interviews, enabling timely analysis of real-world data. This was especially suitable given the limited availability of prospective data in the research setting. Community-based data collection ensured that the sample reflected diverse sociodemographic backgrounds and health access conditions beyond tertiary care populations. Data were obtained from the medical records of breast cancer patients who had undergone neoadjuvant chemotherapy (NAC) during a specific period specifically between January 1 and December 31, 2023, representing a full calendar year of NAC treatment records at the facility. In addition, sociodemographic data were collected through interviews or questionnaires from patients or families who were willing to participate.

This approach differs from conventional hospital-based studies, which often focus on patients already integrated within advanced healthcare systems. By involving participants from various healthcare levels, including primary and secondary facilities, the study captures the lived experiences of individuals often omitted from specialized clinical research. This diversity strengthens the external validity and supports the applicability of findings to a wider population base.

Inclusion Criteria consist of patients aged ≥18 years who have been diagnosed with breast cancer based on histopathological examination, have undergone neoadjuvant chemotherapy within the last year, have complete medical records related to the type of chemotherapy, response to therapy, and tumor characteristics, and patients or family members who are willing to provide sociodemographic information through interviews or questionnaires.

Exclusion Criteria is patients with stage IV breast cancer (distant metastasis) at the time of initial diagnosis, those who did not complete the neoadjuvant chemotherapy regimen according to protocol, those with a history of other types of cancer or severe comorbidities (such as heart failure, kidney failure, or severe autoimmune diseases) that may affect therapy outcomes, and patients who refuse or do not provide consent to participate in the study.

Research Location

This study was conducted at PKU Muhammadiyah Gombong Hospital, Central Java, Indonesia from November 2023 to April 2024.

Instruments

This research instrument uses medical records, questionnaires, and Social Support Scales. Medical records are used to obtain clinical data, including age, breast cancer subtype, the NAC protocol used, and therapy response (categorized as partial response, complete response, or progressive). The sociodemographic questionnaire contains questions related to education level, economic status, occupation, distance from residence to healthcare facilities, and the type of health insurance owned. The Social Support Scale contains standardized instruments such as the Medical Outcomes Study Social Support Survey (MOS-SSS) used to measure the level of social support for patients. This tool was selected for its brevity, multidimensionality, and high reliability in various health-related research contexts. Moreover, the MOS-SSS has been previously adapted and validated in Indonesian populations, demonstrating strong cultural compatibility and psychometric performance. The MOS-SSS has been previously translated and culturally adapted for use in Indonesia using standard forward–backward translation procedures. Its construct validity and internal consistency have been tested in prior Indonesian studies, showing good psychometric properties with Cronbach’s alpha values exceeding 0.85. This supports the instrument’s appropriateness for assessing perceived social support in Indonesian cultural settings.

The Sociodemographic Questionnaire has been tested for content validity through discussions with public health and oncology experts. All items in the questionnaire have a Content Validity Index (CVI) above 0.8, which is considered to meet the validity criteria. The reliability test was conducted using test-retest reliability with a coefficient of reliability > 0.7, which indicates good reliability. Meanwhile, the Social Support Scale (MOS-SSS) has undergone construct validity testing using Exploratory Factor Analysis (EFA), resulting in a factor loading > 0.4 for each item. In the reliability test, a Cronbach's Alpha of 0.9 was obtained for the entire scale, indicating very good internal reliability.

Procedure

Clinical Data Collection begins with the gathering of medical records obtained with written permission from the hospital or healthcare facility after receiving ethical approval. Data collection is carried out by a research team trained to read medical records. Sociodemographic Data Collection is conducted through direct interviews using structured questionnaires. If the patient has already passed away, sociodemographic data is obtained from close family members (surrogate informants) who are willing to provide information. The completion of the questionnaire is carried out at a healthcare facility or the patient's home, according to the participants' preference. The measurement of Social Support was conducted by asking patients to fill out the social support scale independently. If the patient has difficulty reading or understanding the questions, the researcher assists by reading the instructions and questions without influencing the answers. The collected data is re-examined to ensure completeness and accuracy, followed by cross-verification of questionable data to reduce bias. Data is encrypted and stored securely to maintain confidentiality.

In cases where patients were deceased, informed consent was obtained from a legally authorized representative or closest family member (surrogate informant) who had sufficient knowledge of the patient's background. Participation was entirely voluntary, and data were only collected if clear, documented consent was provided. If no reliable informant was available or consent was declined, the subject was excluded from the study. To ensure the accuracy of retrospective data, all medical records were reviewed independently by two trained data abstractors. Any discrepancies were resolved through team discussion and re-verification. For sociodemographic information collected through interviews, standardized and validated questionnaires were used, and responses were cross-checked with any available documentation (e.g., national ID, insurance records) when possible, to reduce recall bias and improve data reliability.

To ensure data quality and consistency, all data collectors underwent structured training sessions conducted by the research team. The training covered interview ethics, question standardization, non-verbal communication, and strategies to avoid leading questions. Interviewers were also trained to administer the MOS-SSS and sociodemographic questionnaire using a standardized script. A pilot test was conducted with 10 participants to evaluate inter-rater reliability, where two interviewers independently recorded responses. The results showed strong consistency (Cohen's kappa > 0.85) across key variables. Regular monitoring and periodic team discussions were held throughout the data collection phase to address discrepancies and ensure data integrity.

Data Analysis

Statistical analysis using the Chi-Square Test to examine the relationship between categorical variables such as education level or type of insurance with response to NAC. Mann-Whitney Test to compare the average of continuous variables such as age and distance to facilities between groups with different responses. while to identify the sociodemographic factors that serve as independent predictors of response to NAC using Multinomial Logistic Regression test categorized into three categories (categorized as partial response, complete response, or progressive). Independent variables include education level, economic status, type of insurance, distance to healthcare facilities, and social support. The results of the analysis are presented in the form of Odds Ratio (OR), 95% confidence intervals, and p-values to determine statistical significance, use SPSS version 28.

This model was chosen over binary logistic regression because the dependent variable (response to NAC) is nominal and consists of more than two unordered categories. Multinomial logistic regression enables simultaneous comparisons of partial and progressive responses against the reference category (complete response), thus providing a more detailed understanding of how each sociodemographic factor influences the likelihood of suboptimal treatment outcomes. This approach is suitable for modeling non-hierarchical categorical outcomes, which aligns with the structure of our clinical response data.

Prior to conducting multinomial logistic regression, assumption checks were performed to ensure model validity. Multicollinearity was assessed using Variance Inflation Factor (VIF), with all values below 2.5, indicating acceptable levels and no serious multicollinearity among predictors. The sample size (n = 144) was also deemed adequate, as it met the minimum ratio of at least 10 cases per predictor category, allowing for reliable parameter estimation. Missing data were minimal (<5%) and primarily affected non-critical variables. We applied listwise deletion to exclude records with incomplete key variables (e.g., outcome or major predictors), as the extent of missingness did not justify imputation and would not significantly impact statistical power or generalizability.

Ethical approval

The research received ethical clearance from the Health Research Ethics Committee with reference number 210.6/II.3.AU/F/KEPK/VIII/2023. All participants were thoroughly informed about the study's aims and procedures, and their participation was completely voluntary, including consent from surrogate informants for deceased patients. The confidentiality of participants' personal data was strictly upheld and used exclusively for research purposes. Informed written consent was obtained from each individual before data collection began.

RESULTS

The results of the descriptive analysis of 144 samples show that the majority of patients have low levels of education (41.7%) and are in low economic status (48.6%). Most patients use the national insurance as a form of financial protection (69.4%), while 9.8% of patients do not have insurance. From the continuous variable data, the average age of patients is 50.3 years with a standard deviation of 10.4 years, and the median value is 51 years (interquartile range: 44–58 years). The average distance of patients to healthcare facilities is 12.8 km with a standard deviation of 8.5 km, while the median value shows a distance of 10 km (interquartile range: 5–20 km), as shown in Table 1.

Table 1. Characteristic respondent (n=144)

Variable	n (%)	Mean (SD)	Median	IQR
Age (years)		50.3 (10.4)	51	44 – 58
Distance to Facility (km)		12.8 (8.5)	10	5 – 20
Social Support (MOS-SSS)		65.2 (12.8)	67	58 – 75
Education Level				
Low	60 (41.7)			
Moderate	50 (34.7)			
High	34 (23.6)			
Economic Status				
Low	70 (48.6)			
Moderate	50 (34.7)			
High	24 (16.7)			
Type of Insurance				
National Insurance	100 (69.4)			
Private Insurance	30 (20.8)			
No Insurance	14 (9.8)			

*IQR = Interquartile Range
Source: Primary Data (2024)

The results of the statistical analysis show a significant relationship between sociodemographic variables and the response to neoadjuvant chemotherapy. Based on the Chi-Square test, education level, economic status, and type of insurance have a significant influence on therapy response ($p < 0.05$). Patients with low education levels, low economic status, and no insurance or only using national insurance tend to have worse responses to NAC. The Mann-Whitney analysis also shows significant differences in age and distance to healthcare facilities among therapy response groups.

Table 2. Chi square and mann-whitney test results (n=144)

Variable	Response to NAC			p-value
	Complete Response	Partial Response	Progressive Disease	
Age (years)	48 (42-55)	52 (45-50)	55 (48-65)	0.023
Distance to Facility (km)	8 (5-15)	12 (8-20)	15 (10-25)	0.015
Education Level				
Low	22	27		0.033
Moderate	28	18		
High	20	10		
Economic Status				
Low	26	30		0.012
Moderate	29	14		
High	15	11		
Type of Insurance				
National Insurance	50	39		0.021
Private Insurance	15	9		
No Insurance	5	7		

*Age and Distance to Facility: Median (Interquartile Range)
Source: Primary Data (2024)

Patients with a progressive response to NAC tend to be older (median 55 years) and live farther from healthcare facilities (median 15 km) compared to the group with complete or partial response, as shown in Table 2. These results indicate that sociodemographic factors, including education, economy, type of insurance, age, and distance to facilities, play an important role in influencing the outcomes of NAC therapy.

Table 3. Multinomial logistic regression analysis test results (n=144)

Variable	OR	95% CI	p-value
Education Level			
Partial Response	2.50	1.10 – 5.70	0.031
Progressive Disease	4.20	1.60 – 10.90	0.004
Economis Status			
Partial Response	3.30	1.50 – 1.70	0.003
Progressive Disease	6.40	2.20 – 18.60	0.001
Type of Insurance			
Partial Response	1.90	0.80 – 4.50	0.127
Progressive Disease	3.00	1.10 – 8.10	0.035
Distance to Facilit (km)			
Partial Response	1.20	1.10 – 1.40	0.002
Progressive Disease	1.50	1.20 – 1.80	0.001
Social Support (MOS-SSS)			
Partial Response	0.80	0.70 - 0.95	0.010
Progressive Disease	0.70	0.60 – 0.85	<0.001

Source: Primary Data (2024)

Complete response is used as a reference group to compare the likelihood of patients having partial or progressive responses based on sociodemographic factors. In partial response, patients with low education have a 2.50 times greater likelihood of having a partial response compared to patients with high education ($p = 0.031$). Then, patients with low economic status have a 3.30 times greater likelihood of having a partial response compared to those with high economic status ($p = 0.003$). In the variable Distance to Facility, each 1 km increase in distance increases the likelihood of a partial response by 1.20 times ($p = 0.002$).

Results on Progressive Response show that patients with low education have a 4.20 times greater likelihood of having a progressive response compared to patients with high education ($p = 0.004$). Patients with low economic status have a 6.40 times greater risk of a progressive response compared to those with high economic status ($p = 0.001$). Meanwhile, for Distance to Facility, each 1 km increase in distance increases the likelihood of a progressive response by 1.50 times ($p = 0.001$). Higher levels of social support have a protective effect, reducing the likelihood of a progressive response by 30% (OR = 0.70, $p < 0.001$) as shown in Table 3.

The overall model fit was assessed using Nagelkerke's pseudo R-squared, which yielded a value of 0.421, indicating that approximately 42.1% of the variance in NAC response can be explained by the sociodemographic predictors included in the model. Additionally, the model's information quality was evaluated using the Akaike Information Criterion (AIC), which was 288.3, suggesting a relatively efficient model given the number of parameters. These goodness-of-fit indicators support the robustness of the multinomial logistic regression model in explaining the variation in chemotherapy outcomes based on community-level sociodemographic variables.

These disparities reflect not only individual-level vulnerabilities but also structural limitations within community health systems. For example, patients residing farther from healthcare facilities often live in areas with limited public transportation and reduced frequency of mobile health services, which contributes to delayed or missed treatment. Similarly, the high proportion of patients with low education and economic status underscores unequal access to health education and preventive care resources within the community. These patterns suggest that the uneven distribution of health infrastructure and inadequate resource allocation at the community level may amplify the effects of sociodemographic disadvantages on chemotherapy outcomes.

DISCUSSION

The analysis results show that the majority of breast cancer patients in this study have a low level of education (41.7%). This is consistent with findings from previous research that indicate a low level of education is often associated with limited health understanding and delays in receiving treatment (10). Patients with low education levels may have more limited access to relevant medical information, thereby affecting decision-making related to medical care and breast cancer treatment. In addition, this educational factor is also related to the patient's social and economic status. Several studies have revealed that people with higher education levels tend to have better access to healthcare resources, are more aware of the importance of early cancer detection and are more proactive in seeking treatment information (11,12).

Most patients (48.6%) come from low economic status, indicating a gap in access to optimal medical care. Low economic conditions often limit patients' ability to obtain adequate healthcare, especially in terms of treatment costs and transportation to healthcare facilities (13). Patients with low economic status may also be more vulnerable to delays in diagnosis and treatment, which contribute to poorer prognosis in breast cancer cases. A study by (14), highlights the importance of interventions that can reduce the financial burden for cancer patients from low-income groups, such as reducing treatment costs or providing more affordable health insurance, to improve the survival rates and quality of life for cancer patients (15,16).

The majority of patients (69.4%) use the national health insurance, which indicates that the health insurance system in Indonesia, although still limited in coverage and quality, has provided basic access for most cancer patients to receive treatment (17,18). However, the 9.8% of patients without insurance indicate the presence of a group that is highly vulnerable to financial limitations in obtaining treatment. The unaffordability of treatment costs can lead to treatment abandonment and worse clinical outcomes. A study by (19), mentioned that health insurance ownership is associated with increased adherence to treatment and reduced financial burden of cancer treatment, which in turn can improve treatment outcomes and patients' quality of life.

The average age of patients in this study is 50.3 years with a median of 51 years, indicating that the majority of patients are in middle adulthood. This is consistent with the general pattern of breast cancer in Indonesia, where breast cancer is more frequently found in middle to late adulthood (20). Age is an important factor in cancer prognosis, where older patients often have a worse prognosis due to comorbidities and a lower response to treatment. Age also plays a role in understanding and accessing medical information, where younger patients are often more active in seeking treatment information and more responsive to medical care (21,22).

The average distance of patients to healthcare facilities is 12.8 km, with an interquartile range of 5–20 km, indicating differences in accessibility to healthcare facilities among patients. A greater distance to healthcare facilities can be a significant barrier for cancer patients, especially in terms of transportation costs and the time required to reach those facilities (23,24). This can lead to delays in cancer diagnosis and treatment, which in turn negatively impacts prognosis (25). Research by (26), shows that patients living closer to healthcare facilities have higher adherence rates to treatment schedules and routine check-ups, which increases the likelihood of early detection and more effective treatment.

The spatial disparities observed in this study are not merely geographic but reflect deeper structural inequalities between urban and rural areas. Rural communities often face chronic underinvestment in healthcare infrastructure, limited availability of oncology specialists, and fewer transportation options—all of which compound the barriers to timely and effective cancer treatment. These spatial inequities are systemic and require structural policy responses. Decentralizing cancer care through mobile chemotherapy units, telemedicine consultations, and rural oncology outreach programs can help bridge the urban–rural care gap. Additionally, strengthening referral systems and integrating cancer services into primary healthcare networks may improve accessibility for remote populations. Such reforms are essential to achieve spatial justice in cancer care delivery.

The results of this study indicate that patients with low education levels have a 2.50 times greater likelihood of having a partial response to neoadjuvant chemotherapy (NAC) compared to patients with higher education levels ($p = 0.031$), as well as a 4.20 times greater likelihood of experiencing progressive response ($p = 0.004$). These findings are consistent with several previous studies that show education level has a significant impact on patients' understanding of their disease and treatment, which ultimately affects their adherence to medication (27).

According to research by (28), patients with lower levels of education tend to have a more limited understanding of the importance of proper medical therapy and may not receive sufficient information regarding the risks and benefits of cancer treatment. Higher education levels are often associated with increased awareness of the importance of early diagnosis and timely treatment. Additionally, a lack of education can contribute to the neglect of treatment or delays in adhering to the recommended chemotherapy schedule, which in turn worsens the response to therapy (29,30).

This study also found that patients with low economic status have a 3.30 times greater likelihood of having a partial response to NAC compared to patients with high economic status (p = 0.003), and a 6.40 times greater likelihood of experiencing a progressive response (p = 0.001). This indicates that economic factors play a very important role in determining treatment outcomes. Research by (31), shows that patients with low economic status often face difficulties in covering the medical care costs required for intensive cancer therapies such as neoadjuvant chemotherapy. These financial resource limitations can hinder patients from adhering to their treatment plans effectively, including delays in medication and neglect of follow-up care, which contribute to suboptimal or progressive responses to treatment. Furthermore, low economic status is often associated with higher stress levels, which can affect overall health and response to cancer therapy (32,33).

The research results show that every 1 km increase in distance to healthcare facilities increases the likelihood of a partial response by 1.20 times (p = 0.002), and a progressive response by 1.50 times (p = 0.001). This reflects that accessibility to healthcare facilities plays a key role in determining cancer treatment outcomes. Research by (34), shows that greater distance to healthcare facilities can hinder patients' access to timely therapy and affect adherence to treatment. Patients living far from healthcare facilities may have difficulty attending chemotherapy treatment schedules and routine check-ups, which risks causing delays in diagnosis and treatment. Greater distances are also associated with higher transportation costs and longer travel times to reach the hospital, which in turn reduces the quality of the patient's experience in undergoing cancer treatment (35,36).

The results of this study also show that higher levels of social support have a protective effect, reducing the likelihood of progressive response by 30% (OR = 0.70, p < 0.001). These findings indicate the importance of social support in improving cancer patients' treatment outcomes. Previous studies have shown that higher social support can improve the quality of life of cancer patients and help them cope with the stress associated with a cancer diagnosis and intensive treatment. Emotional support from family, friends, and social groups can reduce anxiety, improve adherence to treatment, and motivate patients to continue their care. Strong social support is also associated with improved mental and physical health of patients, which in turn can enhance their response to cancer treatment (37,38).

Unlike in Western contexts where social support is often individualized and professionalized, in Indonesia, social support frequently emerges from extended family networks, religious communities, neighborhood associations (RT/RW), and informal caregiving groups. These collectivist dynamics provide both emotional and practical assistance, such as accompanying patients to treatment or organizing communal fundraising for medical expenses. Culturally grounded interventions such as involving religious leaders, utilizing community health volunteers (kader), or developing family-based education sessions may be especially effective in enhancing treatment adherence and psychological resilience in Indonesian cancer patients.

In low-resource settings like Central Java, operationalizing social support interventions can be achieved through existing community and familial structures. Community health volunteers (kader), religious leaders, and women's groups can be mobilized to provide structured emotional support, accompany patients to appointments, or assist in medication reminders. Peer support groups of cancer survivors can also play a role in reducing stigma and improving morale. These interventions require minimal financial investment but can be highly impactful due to strong communal values and collectivist cultural norms. Embedding social support strategies within primary care services and public health outreach programs could enhance accessibility and sustainability while improving chemotherapy outcomes.

The results of this study provide important insights for the development of community-based interventions and health policies. First, more intensive health education programs are needed for patients with low education levels to enhance their understanding of cancer treatment and the importance of therapy adherence. Second, for patients with low economic status, it is important to provide financial support and reduce cost barriers in cancer treatment, such as offering cost subsidies or more affordable insurance programs.

Additionally, health policies also need to consider the accessibility of healthcare facilities, such as improving transportation infrastructure or providing healthcare services closer to communities. Lastly, social support programs involving the patient's family, friends, and surrounding community can be an important strategy in improving cancer treatment outcomes, as emotional support can strengthen the patient's mental and physical resilience during treatment.

Similar disparities in breast cancer care have also been observed in Southeast Asia. A study in Malaysia found that socioeconomic status and distance to oncology centers were significant predictors of delayed treatment initiation (39). In the Philippines, community-based navigation programs improved patient adherence by leveraging family and religious networks (40). These findings resonate with the structural barriers identified in our Indonesian context.

These findings can be meaningfully interpreted through the lens of the Social Determinants of Health (SDH) framework, which emphasizes that health outcomes are shaped by social, economic, and environmental conditions beyond clinical care. Education level, economic status, distance to care, and social support are key determinants that intersect with structural inequities in the healthcare system. Recognizing these factors as systemic rather than individual failings reframes the policy response—from focusing solely on treatment delivery to addressing upstream determinants. By applying the SDH framework, this study contributes not only to empirical understanding but also to the broader discourse on health equity, suggesting that policy interventions should prioritize decentralization of cancer services, investment in rural health infrastructure, and community empowerment to mitigate social vulnerabilities.

It is important to note that, due to the retrospective nature of this study, the directionality of observed associations cannot be fully established. For example, while low education and income appear to predict suboptimal response to chemotherapy, it is also possible that disease progression or psychological distress influenced socioeconomic stability or social support over time—raising the possibility of reverse causality. Despite this limitation, the sociodemographic patterns identified here can serve as a foundation for developing predictive models in future prospective studies. By incorporating these variables into risk stratification tools, clinicians and policymakers may be better equipped to identify high-risk patients and design targeted interventions to improve outcomes.

Limitations and Cautions

This study has several limitations that should be considered in interpreting the findings. First, the retrospective design limits the ability to establish causal relationships between sociodemographic factors and chemotherapy response. Second, the use of secondary data from medical records and interviews with surrogate informants (in cases where patients were unavailable) may introduce recall bias or incomplete data. Third, while the study includes patients from multiple healthcare levels (primary, secondary, and tertiary), the geographic scope is limited to one district in Central Java, which may affect the generalizability of the findings to broader populations. Fourth, the retrospective design limits the ability to infer causality and raises the possibility of reverse causality, where deteriorating health conditions may influence social support or economic stability, rather than the other way around. Additionally, potential confounding variables such as nutritional status, mental health, and comorbidities were not included in the analysis and could influence treatment outcomes. Future studies should consider a more comprehensive set of variables and employ a prospective design for more robust conclusions.

Recommendations for Future Research

Future research should aim to explore the complex interactions between social determinants and treatment outcomes using longitudinal or prospective study designs. It is recommended to include a more diverse population across various geographic and socioeconomic backgrounds to enhance generalizability. Furthermore, qualitative research approaches could provide deeper insights into patient experiences, health-seeking behaviors, and barriers to treatment adherence. Intervention studies that assess the effectiveness of community-based education, financial assistance programs, and social support networks on improving adherence and treatment response would also be valuable. Lastly, integrating digital health tools for health promotion and monitoring patient support systems may offer innovative solutions to reduce disparities in cancer treatment outcomes.

CONCLUSION

This study investigated the influence of sociodemographic factors on the response to neoadjuvant chemotherapy in breast cancer patients and aimed to explore implications for community health promotion. The findings demonstrated that lower education levels, low economic status, greater distance to healthcare facilities, and limited social support were significantly associated with poorer treatment responses, highlighting persistent health disparities in cancer care outcomes. Notably, the study provides novel insights from a community-based setting in Central Java, emphasizing real-world inequities beyond tertiary care centers. These results underscore the critical role of social determinants in shaping treatment efficacy, suggesting the need for targeted health promotion strategies, such as improving health literacy, reducing financial and geographic barriers, and strengthening social support systems—particularly for vulnerable populations.

The strength of this study lies in its community-based design, which captures real-world conditions and includes patients who may be excluded from specialized clinical research. By drawing on a relatively large and diverse sample of 144 patients across varying sociodemographic backgrounds, the findings offer a more inclusive and contextually grounded understanding of treatment disparities. These methodological strengths enhance the external validity of the study and provide a solid empirical foundation for community-oriented interventions and policy decisions.

Beyond reaffirming known disparities, this study makes a novel academic contribution by (1) employing real-world, community-level data rarely used in chemotherapy response studies, and (2) applying the Social Determinants of Health framework to conceptualize cancer treatment outcomes through a structural, equity-focused lens. These elements fill a notable empirical and conceptual gap in the existing oncology and health promotion literature, which often remains centered on hospital-based, biomedical perspectives.

While this study provides valuable insights into the sociodemographic predictors of chemotherapy response, certain limitations should be noted, such as the retrospective design, limited geographic scope, and potential data bias from surrogate reporting. Future research should focus on prospective, multi-center studies, incorporating additional variables like nutritional status and mental health, potentially enhancing our understanding of social disparities in cancer outcomes and informing more equitable healthcare policy and practice.

AUTHOR'S CONTRIBUTION STATEMENT

Conceptualization, methodology, writing—original draft, writing—review. JDAW, JSLAP, NS, BJN, IPP: Conceptualization, Methodology, Writing - Original Draft, Writing - Review & Editing. JDAW, JSLAP, NS: Methodology, Project Administration, Writing - Review & Editing. JDAW, JSLAP, NS, BJN, IPP: Data collection, data curation, Writing - draft, Writing - Editing. PAWS: Writing - Draft, Writing - Review & Editing

CONFLICTS OF INTEREST

All authors disclose no conflicts of interest.

DECLARATION OF GENERATIVE AI AND AI-ASSISTED TECHNOLOGIES IN THE WRITING PROCESS

The authors confirm that this manuscript was entirely developed without the use of generative AI or AI-assisted technologies at any stage, including conception, writing, editing, or formatting. All content was solely produced by the listed authors, with no contribution from artificial intelligence tools.

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