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CANCER AWARENESS AND MYTHICAL PERCEPTION: A STUDY OF CAM AND CAM-MY SCORES IN SOUTHERN PUNJAB POPULATION, PAKISTAN

Original Research

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ABSTRACT

Background: Cancer remains one of the leading causes of mortality in Pakistan, with delayed diagnoses and limited awareness amplifying its impact. In Southern Punjab, low literacy rates, poor access to preventive services, and culturally rooted beliefs obstruct early detection and risk mitigation. Myths about cancer causes persist, often overshadowing validated scientific information and influencing health behaviors. Understanding the extent and distribution of these misconceptions is essential for designing regionally appropriate educational strategies.

Objective: To assess the prevalence of cancer-related myths and awareness levels in the population of Southern Punjab, and to identify demographic factors influencing these beliefs.

Methods: A cross-sectional, quantitative study was conducted over three months involving 176 participants from various districts of South Punjab. Participants were recruited using a mixed sampling method and surveyed via face-to-face interviews, telephone calls, and online questionnaires. The CAM (Cancer Awareness Measure) and CAM-MY (Cancer Awareness Measure–Mythical Causes) tools were administered using a 5-point Likert scale. Data were analyzed using SPSS version 25.0, employing descriptive statistics, paired sample t-tests, and Pearson/Spearman correlation to determine the association between demographics and awareness levels.

Results: The mean CAM score was 0.5481 (SD = 0.1851), significantly higher than the CAM-MY score of 0.4411 (SD = 0.1610), with a mean difference of –0.107 ($p < 0.001$). Education emerged as the strongest predictor, with higher educational levels correlating negatively with belief in myths ($r = –0.138$). Older age showed a negative association with lifestyle-related risk awareness ($r = –0.130$). Gender and residence had minimal influence on overall scores.

Conclusion: Despite adequate general cancer awareness, substantial knowledge gaps exist regarding myth-based beliefs. Educational interventions tailored to demographic profiles—especially targeting less-educated and older individuals—are necessary to bridge this gap and improve cancer prevention outcomes in Southern Punjab.

Keywords: Aged, Cancer Awareness, Cancer Myths, Education, Likert Scale, Public Health, Risk Factors.

INTRODUCTION

Cancer is no longer viewed solely as a genetic disease but rather as a complex ecosystem involving dynamic interactions between malignant and non-malignant components. The tumor microenvironment (TME), composed of cancer cells, immune cells, fibroblasts, endothelial cells, and tissue-specific stromal elements embedded in a remodeled extracellular matrix, plays a pivotal role in cancer progression and therapeutic resistance (1). Despite decades of progress in oncology, cancer remains the leading cause of global disease burden, accounting for over 18 million new cases and nearly 9 million deaths annually, with projections indicating it may become the top cause of mortality by 2060 (2). Among all cancer types, breast cancer has emerged as a particularly pressing challenge in low- and middle-income countries like Pakistan, where incidence is rapidly increasing, especially in women under the age of 50 (3). In Pakistan, breast cancer is frequently diagnosed at an advanced stage, contributing to poor prognoses and increased healthcare costs. Regional registries, such as the one in Karachi, have documented a high prevalence of female breast, head and neck, and esophageal cancers, with male predominance observed in lip, oral cavity, and laryngeal cancers—often associated with widespread tobacco use (4). The molecular basis of carcinogenesis typically involves the activation of oncogenes and inactivation of tumor suppressor genes, leading to unregulated cellular proliferation (5). This process is further exacerbated by the chronic nature of cancer and the escalating costs of diagnostics and therapies, which impose devastating financial burdens on patients and their families, often culminating in catastrophic health expenditures and economic hardship (6).

At the molecular level, mechanisms such as epithelial-mesenchymal transition (EMT) play a critical role in cancer metastasis. In breast cancer, loss of E-cadherin disrupts cell adhesion, facilitating invasion and serving as a hallmark of tumor aggressiveness (7). This process is accompanied by increased expression of motility-associated receptors and signaling pathways, allowing tumor cells to navigate the extracellular matrix and disseminate to distant organs (8). Additionally, epigenetic alterations—such as silencing of apoptotic genes, disruption of autophagy, and dysregulation of microRNA networks—support malignant transformation and survival (9). The etiology of cancer is multifactorial, involving both hereditary predispositions and environmental carcinogens. Known risk factors include ionizing radiation (e.g., radon, UV light), chemical toxins (e.g., tobacco-derived compounds, asbestos, aflatoxins), and oncogenic infections (e.g., HPV, HBV, HCV, EBV), alongside lifestyle contributors such as high intake of processed meat, sedentary behavior, obesity, alcohol use, and smoking (10). Alarmingly, early-onset cancers—those diagnosed before age 50—are rising globally, suggesting that modern environmental exposures and lifestyle factors are impacting younger populations more than previously recognized (11). Despite the availability of validated tools like the Cancer Awareness Measure (CAM) to assess knowledge of evidence-based risk factors, public understanding remains hindered by widespread belief in mythical causes of cancer, such as mobile phones, artificial sweeteners, or stress. To address this, the CAM-MY tool was developed to quantify belief in misinformation and explore its impact on health behavior (12).

Furthermore, the psychosocial dimension of cancer care is often overlooked. Caregiving, typically provided by family members, leads to a reciprocal burden of emotional strain, with caregivers reporting increased levels of anxiety and depression, and patients experiencing distress rooted in guilt and helplessness. This bidirectional stress loop can significantly impair both patient outcomes and caregiver well-being, necessitating integrated psychological support strategies (13). In light of these complex biological, societal, and psychological factors surrounding cancer—especially breast cancer in Pakistan—there is a critical need to evaluate both awareness and misconceptions regarding cancer risk factors. The objective of this study is to assess the prevalence and correlates of evidence-based and mythical cancer beliefs among the general population, thereby enabling more precise, culturally appropriate cancer prevention and education strategies.

METHODS

This study utilized a cross-sectional design conducted over a period of three months in both public and private institutions across South Punjab. A total of 176 participants were recruited through a mixed sampling strategy to enhance the representativeness and reach of the study population. Initially, random sampling was employed to ensure a broad and unbiased selection of respondents, followed by snowball sampling wherein existing participants referred others who met the inclusion criteria. Eligibility criteria required participants to be adults aged above 18 years, permanent residents of South Punjab, and without any prior diagnosis of cancer. Individuals who were

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identified as subject matter experts or who were unwilling to cooperate were excluded from the study to minimize potential biases and ensure data integrity. Data collection was conducted using a structured questionnaire survey, which was administered both online and in physical form to accommodate varying levels of digital access. The questionnaire was carefully translated into English and designed to assess participants' knowledge and beliefs using the Cancer Awareness Measure (CAM) and the CAM-MY tool, focusing on both scientifically validated and mythical cancer causes. Items were presented using a 5-point Likert scale ranging from "strongly agree" to "strongly disagree." The tool underwent preliminary review for content validity by subject experts, although no formal psychometric testing was described.

Prior to participation, written informed consent was obtained from all respondents. The consent form clearly outlined the voluntary nature of participation, the right to withdraw at any stage, and assurances regarding confidentiality, anonymity, and minimal risk. Ethical approval was sought from the relevant Institutional Review Board (IRB). Data were entered and analyzed using IBM SPSS version 25.0. Descriptive statistics including means, medians, and cross-tabulations were calculated to summarize participant demographics and response distributions. Inferential analyses, including independent t-tests, were employed to examine group differences and associations between awareness scores and demographic variables. Results were presented both in tabular and narrative formats to enhance interpretability.

RESULTS

Descriptive analysis revealed that the mean score for the Cancer Awareness Measure (CAM) scale among the 176 participants was 0.5481 (SD = 0.1851), which was significantly higher than the mean score for the CAM-MY scale at 0.4411 (SD = 0.1610). A paired samples t-test indicated a statistically significant difference between the two measures, with a mean difference of –0.10699 (95% CI: –0.11064 to –0.10334), $t(175) = –57.81$, $p < .001$. These results demonstrate that participants showed higher awareness of evidence-based cancer risk factors compared to mythical beliefs. Responses on the CAM-MY scale showed that the most commonly rejected myth was the belief that “Cancer is Contagious,” with 50.5% of participants strongly rejecting the statement. This was followed by rejections of myths such as “Cancer is a punishment from God” and “Cancer is caused by evil spirits.” Conversely, the most commonly endorsed incorrect myths included beliefs that cancer could be caused by the use of hair dyes, stress, living near power lines, physical trauma, and sugar intake. On the CAM scale, participants were most aware of scientifically validated risk factors, with high levels of agreement regarding the cancer risk associated with alcohol consumption, physical inactivity, sunburns, obesity, and consumption of processed meat. Demographic correlations showed that gender, age, education level, and residence influenced responses. Men were more likely than women to agree with myths linking cancer to sugar and trauma, and showed higher concern about power lines. Educational level had the strongest negative correlation with belief in myths, particularly with the belief that hair dyes and antiperspirants cause cancer (Pearson’s $r = –0.138$). Age positively correlated with belief in the hair dye myth ($r = 0.161$) but negatively with the belief that stress causes cancer ($r = –0.163$). Rural participants more frequently endorsed myths related to trauma and sugar, whereas urban residents leaned more toward neutral or disagree responses.

Regarding awareness of actual cancer risks, educational level positively correlated with knowledge about sunburn as a risk factor ($r = 0.059$), while age showed a moderate negative correlation with understanding the cancer risk associated with obesity ($r = –0.130$) and processed meat consumption ($r = –0.213$), indicating lower awareness in older individuals. Gender showed weak correlations, with slight negative association between males and awareness of sedentary lifestyle risks ($r = –0.062$). Residence had minimal influence on validated risk awareness, though awareness of sunburn risk was slightly higher in urban residents ($r = 0.103$). Subgroup analysis revealed variations in cancer awareness (CAM) and myth endorsement (CAM-MY) across gender, age, education level, and place of residence. Males demonstrated relatively higher agreement with scientifically validated cancer risk factors but also endorsed common myths such as the association of sugar and physical trauma with cancer. Females, on the other hand, showed more skepticism toward these myths, although both genders held similar concerns about hair dyes and antiperspirants. Respondents aged 18–30 exhibited mixed awareness patterns with more responses in the "agree" or "disagree" range, whereas participants aged 31 and above tended to express more decisive opinions, albeit with a modest decrease in recognition of obesity and processed meat as risk factors. Educational level strongly influenced myth rejection, with graduate and postgraduate participants consistently showing stronger rejection of CAM-MY items and better awareness of validated CAM risks. Undergraduate respondents, while often disagreeing with myths, lacked consistency in rejecting less obvious misconceptions. Rural participants demonstrated higher endorsement of cancer myths—particularly around sugar, trauma, and power lines—compared to their urban counterparts, who were more likely to respond neutrally or disagree. Nonetheless, awareness gaps

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persisted across all groups, suggesting a broad need for targeted education. These patterns underscore the necessity for tailored awareness campaigns focusing on males, individuals under 35, less educated populations, and rural communities.

Table 1: Paired Samples Statistics for CAM and CAM-MY

		Mean	N	Std. Deviation	Std. Error Mean
Pair	Mean CAM_MY	.4411	176	.16095	.01213
	Mean CAM	**.5481**	**176**	**.18513**	**.01395**

Table 2: Paired Samples Statistics for mean CAM and mean CAM-MY

	Paired Differences					T	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Mean CAM_MY – mean CAM	**-.10699**	**.02455**	**.00185**	**-.11064**	**-.10334**	**-57.805**	**175**	**.000**

Table 3: Correlation of Demographic Variables with Belief in Mythical Cancer Causes in Southern Punjab

	Eating sugar makes cancer grow faster."	**Hair Dyes and Antiperspirant can cause cancer.**	**Living near power lines increases the risk of developing cancer.**	**Stress is a direct cause of cancer.**	**Physical trauma (e.g., injuries or surgeries) can cause cancer to develop.**
Gender	P = -.090	P=.076	P= -.117	P= .018	P= -.066
	S= -.099	S= .068	S= -.121	S= .019	S= -.064
Age	P=.009	P= -.161	P= -.001	P=-.163	P= -.098
	S=.011	S= -.182	S= -.013	S= -.168	S= -.112
Educational level	P= -.006	P= -.138	P= -.117	P= -.066	P= -.054
	S=.012	-.116	S= -.085	S= -.037	S= -.007
Residence	P= -.004	P= -.006	P= -.096	P= .048	P= .133
	S= -.003	**S= -.021**	**S= -.094**	**S=.039**	**S=.132**

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Table 4: Association of Demographic Factors with Awareness of Evidence-Based Cancer Risk Factors in Southern Punjab

	Drinking alcohol increases the risk of developing cancers of the mouth, throat, esophagus, liver, breast, and colon.	**Repeated sunburns, especially during childhood, increase the risk of skin cancer, including melanoma**	**A sedentary lifestyle is associated with an increased risk of cancers such as breast, colon, and endometrial cancer.**	**Being overweight or obese is linked to a higher risk of several cancers, including breast, colon, kidney, and pancreatic cancer**	**Eating large amounts of red and processed meats increases the risk of colorectal cancer.**
Gender	P= .026	P= .030	P= -.062	P= .017	P= .029
	S=.037	S= .046	S= -.049	S= .023	S= .030
Age	P= .048	P= -.058	P= -.084	P= -.130	P= -.213
	S= .046	S= -.048	S= -.086	S= -.128	S= -.220
Educational level	P= .030	P= .059	P= .062	P= -.014	P= -.080
	S= .024	S= .085	S= .076	S= -.001	S= -.027
Residence	P= .045	P= .103	P= .017	P= .104	P= -.014
	S= .037	**S= .091**	**S= .001**	**S= .102**	**S= -.018**

Table 5: Subgroup Analysis of CAM and CAM-MY

Demographic Factor		**CAM Awareness Trend**	**CAM-MY Belief Trend**
Gender	Male	Higher belief in actual risks	Belief in sugar/trauma myths
	Female	Skeptical but aware	Less myth endorsement
Age	18–30	Mixed awareness, more “agree/disagree”	Mixed myth belief patterns
	31+	More definite opinions	More definite opinions
Education	Undergraduate	Agree/Disagree pattern	Myths partly rejected
	Graduate+	More balanced opinions	Strong myth rejection
Residence	Urban	More neutral/aware of real risks	Neutral to moderate rejection
	Rural	More prone to myths	Higher myth endorsement

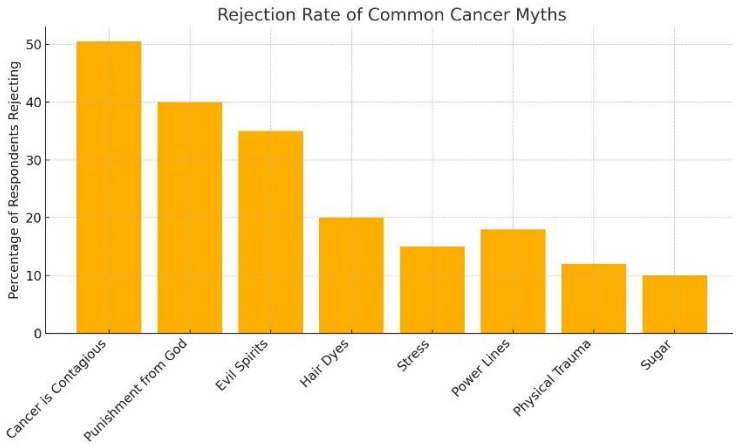

Figure 1 Rejection Rate of Common Cancer Myths

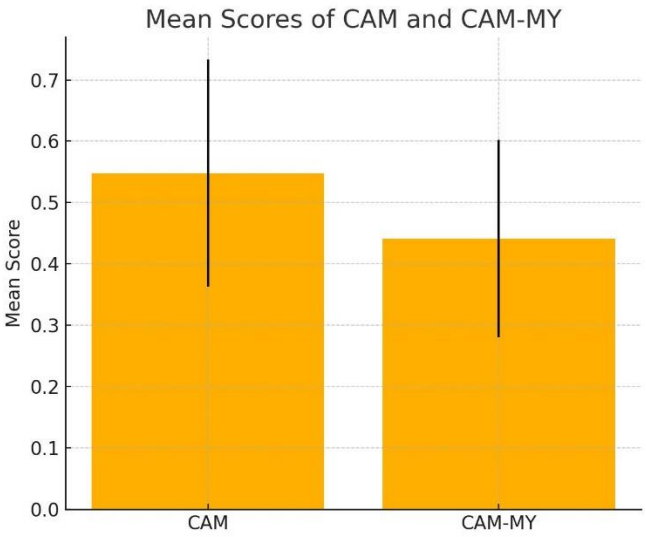

Figure 2 Mean Scores of CAM and CAM-MY

DISCUSSION

This study assessed cancer-related awareness and beliefs in Southern Punjab, Pakistan, using two validated instruments: the Cancer Awareness Measure (CAM) and the CAM-MY scale, which respectively captured evidence-based understanding and belief in mythical cancer causes. The combined application of these tools provided a comprehensive lens into both knowledge gaps and prevailing misconceptions within the local population (14). While CAM-MY draws on evidence-informed constructs, it must be acknowledged that not all included myths have been categorically ruled out by science, which introduces some interpretative limitations. Nonetheless, the significant gap observed between CAM and CAM-MY scores reflects a dual narrative—while participants demonstrated moderate awareness of validated cancer risk factors, belief in widely circulated myths remained pervasive. Findings revealed marked disparities in awareness and myth endorsement across demographic groups. Males, individuals from rural communities, and those with lower levels of formal education exhibited greater susceptibility to myth-based beliefs such as those linking cancer with sugar intake or physical trauma. In contrast, females, urban residents, and individuals with higher education—particularly those exposed to biological sciences—were more likely to express skepticism or maintain neutrality toward these myths. These patterns resonate with findings from other contexts where incomplete understanding of cancer risk behaviors, such as concurrent smoking and vaping, allowed misinformation to flourish, thus compromising harm reduction efforts (15,16). The convergence of belief in both evidence-based and mythical causes suggests an overgeneralized perception of cancer etiology, where individuals equate risk with any perceived "unhealthy" factor regardless of scientific validation.

While studies from high-income countries (HICs) have noted gendered trends—reporting superior risk factor knowledge among males and spiritual attributions among older women (17)—the current data from Pakistan reflect minimal urban-rural variation in awareness. This contrasts with intra-urban disparities reported in England, where socioeconomic deprivation produces concentrated “health deserts” despite geographic proximity to healthcare infrastructure (18). The limited regional differences in Pakistan may be attributed to uniformly inadequate rural healthcare systems, which normalize low awareness across regions. These findings indicate that in low- and middle-income countries (LMICs), interventions must target populations nationally rather than regionally, unlike HICs where strategic, localized efforts may be more effective. Education emerged as a strong determinant of awareness, especially among participants with tertiary education and exposure to science-related subjects. This mirrors earlier evidence demonstrating that health literacy initiatives not only improve cancer knowledge but also enhance screening uptake and treatment adherence, particularly when adapted for low-literacy groups (19,20). The data further emphasize that formal education, especially at the undergraduate or graduate level, offers protective value against myth endorsement. However, most participants under-recognized modifiable lifestyle risk factors such as

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alcohol use, physical inactivity, obesity, and processed meat consumption. This underappreciation signals a gap in translating general health awareness into specific cancer prevention behaviors, despite strong scientific consensus linking these factors to cancer risk (21).

One surprising observation was the lack of significant association between reported lifestyle habits and cancer awareness in this cohort, which stands in contrast to previous work indicating a 32% reduction in endometrial cancer risk with adherence to healthy behaviors (22). This divergence warrants deeper investigation into the social and behavioral determinants that mediate the translation of knowledge into action in the Pakistani context. The study's strengths lie in its use of validated tools, a representative sampling strategy across diverse institutions, and comprehensive demographic analyses. However, limitations include the reliance on self-reported data, absence of psychometric testing for the adapted CAM-MY scale, and potential recall or social desirability biases. Additionally, the cross-sectional design precludes causal inference, and the exclusion of non-literate individuals may have underestimated the extent of misinformation in lower socioeconomic strata. Furthermore, while the current CAM-MY tool effectively identified generalized mythical beliefs, it may not fully capture culturally specific myths unique to South Punjab, highlighting the need for localized adaptation in future research. To strengthen future studies, longitudinal designs should be employed to evaluate changes in awareness over time and in response to interventions. Expanding the scope of CAM-MY to incorporate regionally relevant myths and testing its validity across different literacy levels will enhance its utility. Integrating community-based educational outreach with structural healthcare reforms is essential to translate awareness into behavioral change. The findings underscore the urgency for demographically tailored interventions—particularly targeting males, individuals under 35, rural populations, and those with limited education—to correct misinformation and foster accurate cancer prevention knowledge.

CONCLUSION

This study highlights critical insights into cancer awareness dynamics in Southern Punjab, revealing a complex interplay between scientific understanding and persistent cultural myths. While participants showed familiarity with established cancer facts, their awareness of modifiable risk factors remained limited, and myth-based beliefs continued to influence perceptions. The findings underscore the importance of demographic factors, particularly education level, in shaping awareness patterns, with formal education—especially in the biological sciences—emerging as a protective factor against misinformation. To effectively reduce the cancer burden in Pakistan, there is a pressing need for culturally tailored awareness strategies that not only address persistent myths but also emphasize actionable lifestyle changes. Harnessing the reach of community networks, religious platforms, and mass media can play a transformative role in translating knowledge into prevention and fostering informed health choices at the population level.

AUTHOR CONTRIBUTION

Author	Contribution
Summaya Adeel	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Sameeullah	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Hina Mukhtar	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Mahnoor Mukhtar	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Muhammad Okasha Khan	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published
Muhammad Sulaiman Saeed	Substantial Contribution to study design and Data Analysis Has given Final Approval of the version to be published
Saba Ajmal	Contributed to study concept and Data collection Has given Final Approval of the version to be published
Zainab Ali*	Writing - Review & Editing, Assistance with Data Curation

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