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Planetary Health and Patient Dialogue: Exploring Cancer Perceptions Through Doctor-Patient Communication in the rural Homabay County, Kenya

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Abstract

This study explores the influence of doctor- patient communication on cancer patients' understanding, attitudes, and treatment adherence in Homa Bay County, a rural area in southwestern Kenya increasingly affected by climate- induced health system vulnerabilities. Grounded on Ajzen' s Theory of Planned Behaviour and informed by a planetary health perspective, the research investigates how communication dynamics intersect with challenges such as extreme weather, transportation disruptions, and infrastructural decay. A concurrent mixed-methods design combines structured surveys from 120 cancer patients and caregivers with in-depth interviews of 10 medical doctors. Findings reveal significant systemic communication barriers: 72. 5% of respondents reported doctor-dominated consultations with limited patient input ($p < 0.\ 0.01$), 68. 3% struggled to understand medical instructions due to jargon use ($p < 0.\ 05$), and 61. 2% cited financial constraints as limiting their ability to engage meaningfully in care discussions and follow- up ($p < 0.\ 05$). These challenges are compounded by climate- related disruptions, including transportation delays and frequent power outages, which weaken communication continuity and compromise treatment adherence. Despite these obstacles, the study identifies clear pathways for improvement. Empathetic and culturally responsive communication—particularly when adapted to local environmental realities—enhances patient knowledge, confidence, and perceived control, improving treatment adherence. These improvements in communication practices contribute to better health outcomes even amidst ongoing systemic and environmental disruptions. The study recommends comprehensive policy interventions, including climate- responsive communication training in oncology education and clinical protocols. It proposes targeted, evidence-based strategies to strengthen doctor-patient dialogue in climate-vulnerable healthcare settings, thereby contributing to the literature at the intersection of planetary health, behavioural science, and clinical communication. These insights provide a timely roadmap for strengthening equitable cancer care in the era of climate change.

Keywords: *Planetary health, Doctor-patient communication, Oncology care, Climate change adaptation.*

Introduction

The Planetary Health Paradigm

The contemporary planetary health paradigm signifies a fundamental shift in comprehending the intricate and inseparable connections between human health outcomes and the natural environment, especially regarding accelerating climate change and environmental degradation.

This emerging field acknowledges that human health cannot be sustained without upholding the health of the natural systems that support all life on Earth (Whitmee et al., 2015). The paradigm transcends traditional environmental health approaches by highlighting the interconnectedness of human, animal, and ecosystem health within a rapidly evolving global environment. Globally, climate disruptions are increasingly straining healthcare systems, with effects particularly pronounced in the prevention, diagnosis, treatment, and long-term management of chronic illnesses such as cancer. As global average temperatures continue to rise and extreme weather events become more frequent, intense, and unpredictable, the patterns of cancer incidence and the complexity of care delivery are fundamentally altered (Myers et al., 2021). These changes manifest through multiple pathways, including altered exposure patterns to environmental carcinogens, disrupted healthcare infrastructure, compromised supply chains for essential medications, and increased psychosocial stress among patients and healthcare providers.

Climate Change and Cancer Care in Sub-Saharan Africa

In sub-Saharan Africa, climate-related disruptions have significantly intensified existing public health challenges, with rural and underserved regions shouldering disproportionate burdens. The region faces a complex web of climate-related health risks, including altered patterns of infectious disease transmission, food and water insecurity, extreme weather events, and deteriorating air quality due to increased dust storms and biomass burning. These environmental changes directly and indirectly influence cancer risk factors, treatment accessibility, and health outcomes. Homabay County, strategically located in southwestern Kenya along the ecologically significant shores of Lake Victoria, exemplifies these challenges. The county encounters a constellation of climate-related vulnerabilities, including recurrent severe flooding during intense rainfall periods, prolonged droughts impacting water and food security, deteriorating transport infrastructure that becomes impassable during extreme weather events, and persistently high poverty rates that constrain adaptive capacity. These interconnected conditions create a complex environment that significantly exacerbates existing health vulnerabilities and introduces new challenges for healthcare delivery (Kimani-Murage et al., 2022). The climate-health nexus in Homabay County affects cancer care through various pathways. Environmental disruptions influence not only the incidence of cancer due to increased exposure to environmental carcinogens, contaminated water sources, and air pollutants but also critically undermine patients' ability to access timely, consistent, and adequate treatment. Transportation barriers during flood seasons, power outages affecting chemotherapy storage and delivery, and disrupted communication networks lead to fragmented care delivery.

The Critical Role of Doctor-Patient Communication

Doctor-patient communication is vital to effective cancer care in this complex environmental and healthcare context. Cancer treatment necessitates sustained, nuanced, and ongoing interaction between healthcare providers and patients, directly influencing multiple critical outcomes, including treatment comprehension, emotional adaptation to diagnosis, psychological adjustment to treatment demands, informed decision-making capacity, and long-term treatment adherence behaviours (Street & Mazor, 2019).

Effective communication in oncology settings encompasses multiple dimensions: the exchange of information that ensures patients understand their diagnosis, treatment options, and prognosis; emotional support that addresses patients' fears, anxieties, and concerns; partnership building that engages patients in treatment decisions; and behavioural guidance that promotes

adherence and self-management. These communication functions become even more critical in resource-constrained environments where patients may have limited health literacy, face significant logistical barriers to care, and experience high levels of distress related to their diagnosis and environmental stressors. Nevertheless, provider-centred communication patterns and the limited meaningful involvement of patients remain pervasive challenges in overstretched rural healthcare systems like those in Homabay County. Healthcare providers, dealing with heavy patient loads, limited consultation times, and resource constraints, often default to biomedical communication approaches that prioritise efficiency over patient engagement. Furthermore, climate change introduces new categories of psychosocial stressors that influence how patients perceive their illness, understand treatment recommendations, and interact with healthcare providers.

Theoretical Framework and Research Objectives

This study adopts Ajzen's Theory of Planned Behaviour (TPB) as its primary theoretical framework to systematically examine how communication practices in oncology clinic settings affect patients' cancer-related knowledge acquisition, attitude formation, and perceived control over treatment decisions and outcomes. The TPB provides a robust theoretical foundation for understanding how communication interventions can influence patient behaviour through three key psychological constructs: attitudes toward the behaviour, subjective norms, and perceived behavioural control over the behaviour. The research also incorporates planetary health perspectives to assess how climate-related environmental factors shape communication dynamics and treatment adherence patterns. This integrated approach allows for developing adaptive, context-specific communication strategies to improve cancer outcomes even in environmentally challenging settings like Homabay County.

The primary research objectives include: i) characterising current doctor-patient communication patterns in oncology care settings; ii) identifying specific climate-related barriers that affect communication and treatment adherence; iii) examining the relationship between communication quality and patient outcomes using TPB constructs; iv) developing evidence-based recommendations for climate-adaptive communication strategies; and v) proposing policy interventions to strengthen oncology communication in climate-vulnerable regions.

Literature Review

Planetary Health and Cancer Care: An Emerging Framework

Environmental Determinants of Cancer Risk

The planetary health framework provides a comprehensive lens for understanding how environmental degradation directly and indirectly influences cancer risk, incidence, and outcomes. In cancer care specifically, exposure to air pollutants, including particulate matter, volatile organic compounds, and combustion byproducts; waterborne contaminants such as heavy metals, pesticides, and industrial chemicals; and foodborne carcinogens, including aflatoxins, nitrates, and residual agricultural chemicals, significantly elevates the risk of developing various cancer types (Frumkin et al., 2020). These environmental risk factors in rural Kenyan areas, such as Homabay County, are particularly pronounced and poorly regulated. The uncontrolled use of agricultural chemicals, including banned pesticides that remain available through informal markets, leads to widespread exposure to known carcinogens. Inadequate waste disposal practices, including insufficient industrial and household waste management, contaminate water sources and soil. A reliance on biomass energy for cooking and heating exposes populations to high levels of indoor air pollution,

particularly impacting women and children who spend more time in domestic environments (Onyango et al., 2023).

Climate Change Impacts on Healthcare Delivery

Environmental factors increasingly affect healthcare delivery infrastructure and processes, creating new challenges for the continuity of cancer care. Power outages, which are becoming more frequent due to extreme weather events and ageing infrastructure, jeopardise the safe storage and administration of temperature-sensitive chemotherapy drugs. Flooding and deteriorating road networks, exacerbated by intensifying rainfall patterns, create significant barriers to timely diagnosis, initiation of treatment, and follow-up care. These challenges are particularly acute in remote areas with limited healthcare infrastructure and human resources (Omollo et al., 2022). The implications extend beyond immediate logistical challenges. Disrupted care delivery patterns can lead to treatment delays, dose modifications, or discontinuation, all of which can significantly impact cancer outcomes. Patients may experience increased anxiety and reduced confidence in the healthcare system when environmental factors repeatedly interfere with their care. Healthcare providers may struggle to maintain treatment protocols and deliver consistent patient education when facing unpredictable ecological disruptions.

Adaptive Capacity and Resilience in Healthcare Systems

As climate variability intensifies, cancer care systems must develop an adaptive capacity to ensure continuity, safety, and equitable access to care. This necessitates structural adaptations, such as improved infrastructure and emergency preparedness protocols, and process adaptations, including flexible communication strategies that address climate-related disruptions. Healthcare systems' resilience becomes particularly relevant, emphasising the ability to maintain essential functions and recover swiftly from environmental shocks.

Doctor-Patient Communication in Oncology: Challenges and Opportunities

Fundamental Principles of Effective Oncology Communication

Effective communication is a cornerstone of quality cancer care, directly influencing multiple critical outcomes, including diagnostic accuracy, the effectiveness of treatment planning, patient satisfaction levels, psychological adjustment to illness, and long-term treatment adherence behaviours (Street & Mazor, 2019). Research consistently demonstrates that high-quality communication is linked to improved patient outcomes, reduced medical errors, decreased litigation risk, and enhanced provider satisfaction. In oncology settings, communication serves multiple essential functions. The exchange of information ensures that patients understand their diagnosis, treatment options, potential side effects, and prognosis. Providing emotional support addresses the intense psychological distress that typically accompanies a cancer diagnosis and treatment. Building partnerships involves patients as active participants in treatment decisions. Offering behavioural guidance aids patient self-management and adherence to complex treatment regimens.

Communication Barriers in Resource-Limited Settings

Numerous systemic factors often impede communication effectiveness in resource-limited settings, such as rural areas of Kenya. Heavy provider workloads require that healthcare workers attend to large numbers of patients within a constrained timeframe, limiting opportunities for comprehensive communication. The brief consultation periods, often averaging less than 10 minutes per patient interaction, hinder thorough information exchange and relationship building. Cultural hierarchies prevalent in many African societies can create

additional communication barriers. Traditional respect for authority figures may discourage patients from asking questions, expressing concerns, or disagreeing with healthcare providers. This dynamic can result in seemingly compliant patients with a limited understanding of their condition or treatment requirements (Mulemi, 2023).

Language and Health Literacy Challenges

In Kenya, patients in rural counties encounter significant communication barriers related to language diversity and limited health literacy. Many patients feel more at ease communicating in local languages than in English or Kiswahili, yet medical information is often available solely in official languages. Health literacy levels, particularly concerning complex chronic diseases like cancer, remain low in numerous rural communities. Research illustrates that provider-dominated conversations, characterised by extensive medical jargon and minimal patient participation, can alienate patients, diminish comprehension, and actively discourage question-asking behaviours (Wachira et al., 2022). In contrast, empathetic communication approaches that involve patients in decision-making are consistently linked to better psychological outcomes, improved treatment adherence, and heightened overall satisfaction with care.

Theory of Planned Behaviour in Health Communication

Theoretical Foundations and Applications

The Theory of Planned Behaviour (TPB), developed by Ajzen (1991), offers a robust theoretical framework for understanding how behavioural intentions are formed and translated into actual behaviours. The theory posits that behavioural intentions are shaped by three key psychological constructs: attitudes towards the behaviour, subjective norms regarding the behaviour, and perceived behavioural control over the behaviour. TPB has been widely applied in healthcare contexts to understand and predict various health behaviours, including medication adherence, preventive care utilisation, and lifestyle modifications. The strength of the theory lies in its systematic approach to identifying modifiable factors that influence behaviour, making it particularly valuable for developing targeted interventions.

TPB Applications in Cancer Care Communication

In cancer care settings, clear and supportive communication directly influences patients' attitudes towards treatment by providing accurate information about benefits and risks, addressing misconceptions, and highlighting the importance of adherence. Communication also shapes subjective norms by conveying healthcare provider expectations, connecting patients with social support resources, and addressing cultural beliefs that may impact treatment decisions. Most importantly, effective communication empowers patients by strengthening their perceived control over health outcomes. This includes providing practical guidance for managing side effects, offering strategies for overcoming logistical barriers, and building confidence in patients' ability to navigate the healthcare system (Albarracín et al., 2018).

TPB in Climate-Vulnerable Healthcare Settings

Climate-related stressors such as transportation breakdowns, medication stockouts, or facility closures due to extreme weather events can significantly diminish patients' sense of control over their health outcomes. These environmental challenges may undermine treatment intentions and adherence behaviours unless they are effectively addressed through adaptive communication strategies. Recent research indicates that adaptive communication approaches can buffer environmental stress in high-risk contexts by strengthening behavioural intentions

and building coping capacity. This entails explicitly acknowledging environmental challenges, developing contingency plans, and enhancing patient confidence to maintain treatment despite environmental disruptions (Orbell et al., 2023).

Methodology

This study utilised a mixed-methods research design, integrating quantitative and qualitative approaches to capture the breadth and depth of communication dynamics in oncology care settings. The mixed-methods approach was chosen to provide a comprehensive understanding of complex social phenomena that cannot be fully captured through quantitative or qualitative methods alone. The study was based on a pragmatic philosophical approach, emphasising the practical implications of research findings for enhancing healthcare delivery and patient outcomes. This pragmatic orientation influenced methodological decisions and data interpretation, concentrating on generating actionable insights for healthcare providers, policymakers, and health system managers.

The study was conducted across multiple healthcare settings to ensure a comprehensive representation of contexts for oncology care delivery. Primary data collection took place in six facilities in Homabay County, including public and private institutions catering to diverse patient populations. This selection of settings aimed to capture variations in resource availability, patient demographics, and care delivery models. Homabay County was selected as the primary study site due to the researcher's familiarity with the region and varied patient population, including a significant number of patients referred from rural areas such as Homabay County. This environment facilitated the examination of communication dynamics among patients from different geographic, socioeconomic, and cultural backgrounds, including those facing climate-related challenges in their home communities around Lake Victoria region. The Kenyan healthcare system operates through a tiered structure, with oncology services concentrated in higher-level facilities primarily in urban areas. This centralisation means that many cancer patients, particularly those from rural regions, must travel considerable distances to access specialised care. Consequently, the patient population in urban oncology centres comprises city residents and rural patients who may encounter additional challenges related to transportation, accommodation, and cultural differences.

For the quantitative component, stratified sampling was employed to recruit 120 cancer patients and caregivers, ensuring a representative distribution across several important variables. The stratification variables included cancer type (hematologic malignancies, solid tumours, paediatric cancers), treatment stage (newly diagnosed, active treatment, survivorship), socioeconomic status (assessed through education level and income proxies), and geographic origin (urban vs. rural). Patient inclusion criteria were: confirmed cancer diagnosis, age 18 years or older (or accompanied by a guardian for younger patients), ability to provide informed consent, and willingness to participate in study activities. Exclusion criteria included: severe cognitive impairment that would prevent meaningful participation, active mental illness that would interfere with interview participation, and inability to communicate in English or Kiswahili. Caregiver participants were identified through medical service providers or patient referrals, including family members, friends, or others who regularly supported cancer patients. Caregiver inclusion criteria included age 18 or older, regular patient care or support involvement, and the ability to provide informed consent.

For the qualitative component, purposive sampling was employed to identify 10 healthcare providers with diverse experience levels, professional backgrounds, and institutional contexts. The sample comprised six oncologists (three medical doctors, two nurses, and one surgical

oncologist) and four clinical officers with oncology or related training and experience. Inclusion criteria for providers included current practice in oncology care, a minimum of two years of experience in cancer care, and a willingness to participate in in-depth interviews. The sample aimed to capture diversity in terms of years of experience (ranging from two to 10 years), institutional affiliation (public versus private), and training background (local versus international training).

Quantitative data were collected using structured questionnaires administered in English and Kiswahili via face-to-face interviews. Trained research assistants from the region conducted the interviews, ensuring participants' comfort and language preference.

The questionnaires comprised the following validated instruments:

The Communication Assessment Tool (CAT) measured key aspects of doctor-patient communication, such as clarity of information, emotional support, partnership, and overall satisfaction. The study also adapted the Cancer Knowledge Questionnaire, which was culturally validated and translated into Kiswahili, to assess patients' understanding of cancer-related information, including the disease process, treatment options, side effects, and prognosis. Additionally, a structured questionnaire based on the Theory of Planned Behaviour (TPB) evaluated patients' attitudes, beliefs about treatment outcomes, and perceived control over health. Lastly, the Climate Health Risk Perception Scale assessed patients' awareness of climate-related health risks, perceived vulnerability to environmental threats, and self-reported adherence to prescribed treatments, including medications, appointments, and lifestyle recommendations.

Qualitative data were obtained through various approaches designed to provide a comprehensive understanding of communication dynamics from the perspectives of healthcare providers. For instance, in-depth interviews with healthcare providers focused on several key areas, including current communication strategies, obstacles to effective communication, cultural and linguistic adaptation methods, and perceived effects of climate-related factors on patient consultations and treatment delivery. Interview guides were developed based on a literature review and expert consultation. They included questions designed to explore general communication practices and specific challenges related to environmental factors. The interviews were conducted in English, lasted approximately 60 to 90 minutes, and were audio recorded with participant consent.

Quantitative data were analysed using SPSS version 28, employing various analytical approaches to address distinct research questions. Initial analyses included thorough descriptive statistics to characterise the study sample and key variables. Correlation matrices examined relationships among communication quality, knowledge, attitudes, and adherence variables. Multiple regression analyses were undertaken to identify predictors of treatment adherence, with communication quality, knowledge, and TPB constructs entered as independent variables. Additionally, climate-related variables were incorporated as potential moderators of relationships between communication and outcomes.

Qualitative data were analysed using NVivo 15 software, following Braun and Clarke's (2021) six-step thematic analysis framework. This systematic approach involved familiarising the data through repeated reading and initial note-taking, systematic coding of relevant data segments, identification of potential themes through code clustering, review and refinement of themes, definition and naming of themes, and production of the final report. The coding process employed both deductive and inductive approaches. Deductive coding was guided by the TPB

framework and existing literature on healthcare communication, while inductive coding allowed for identifying emergent themes not anticipated in the theoretical framework. Several stakeholders participated in the coding process to improve reliability and validity. Regular team meetings were conducted to discuss coding decisions, resolve discrepancies, and ensure consistency in theme development.

Mixed-method triangulation was utilised to cross-validate findings from various data sources and analytical approaches. This entailed systematically comparing quantitative and qualitative findings to identify areas of convergence and divergence, thereby providing a more comprehensive understanding of communication dynamics. Integration took place at various levels, encompassing data collection (concurrent timing), analysis (comparison of findings), and interpretation (synthesis of insights). Joint displays and meta-inferences were created to present integrated findings and their implications for theory and practice.

Results and Discussion

Participant Characteristics and Sample Description

Patient and Caregiver Demographics

The study recruited 120 willing patients and caregivers, representing a diverse demographic and clinical characteristics. Patient ages ranged from 28 to 74 years (mean = 52.3 years, SD = 12.8), with 65% of participants being female and 35% male. The types of cancer included breast cancer (28%), cervical cancer (22%), prostate cancer (15%), colorectal cancer (12%), lung cancer (8%), and hematologic malignancies (15%).

Geographic origin analysis revealed that 43% of patients came from rural areas, including 18% specifically from climate-vulnerable regions such as rural Homabay County, while 57% were urban residents. Educational levels varied considerably, with 25% having a primary education or less, 45% having a secondary education, and 30% having post-secondary education. Monthly household income ranged from less than KES 10,000 (32%) to more than KES 50,000 (15%), reflecting the socioeconomic diversity of the sample. The distribution of treatment stages revealed that 35% of patients were in active treatment, 28% were newly diagnosed, 22% were in follow-up care, and 15% received palliative care. The time since diagnosis varied from less than 6 months (38%) to more than 3 years (22%), offering insight into communication experiences across different phases of the cancer journey.

Healthcare Provider Characteristics

The 10 healthcare providers represented a variety of professional backgrounds and experience levels. Medical doctors comprised 30% of the sample, radiation oncologists 20%, surgical oncologists 10%, and clinical officers with oncology training 40%. Years of experience in cancer care ranged from 2 to 20 years (mean = 8.7 years, SD = 5.4), with 60% practising in public institutions and 40% in private facilities. Training backgrounds comprised 70% local medical education and 30% international training or fellowship experience. This diversity offered a comprehensive perspective on communication practices across various institutional contexts and professional preparation backgrounds.

Communication Patterns

Current Communication Dynamics

Quantitative analysis using the Communication Assessment Tool revealed significant variations in communication quality across different dimensions. Overall communication quality scores averaged 3.2 out of 5.0 (SD = 0.8), indicating moderate satisfaction levels with

substantial room for improvement. Information clarity received the lowest scores (mean = 2.8, SD = 0.9), while healthcare provider courtesy received the highest (mean = 4.1, SD = 0.7).

Detailed analysis revealed that communication patterns were primarily provider-led, offering limited opportunities for patients to pose questions, voice concerns, or engage actively in treatment discussions. Time constraints emerged as a significant factor, with an average consultation duration of 8.7 minutes (SD = 3.2), notably below the recommended standards for effective oncology communication. Qualitative findings corroborated these quantitative results, with healthcare providers acknowledging significant challenges in delivering comprehensive communication within existing time constraints. A senior medical oncologist noted: "We know that patients need more time to understand their diagnosis and treatment options, but the reality is that we have to see 40-50 patients per day. It's impossible to spend adequate time with each patient."

Language and Cultural Adaptation Challenges

Language barriers emerged as a significant obstacle to effective communication. While 78% of patients indicated comfort with Kiswahili for medical discussions, only 23% felt comfortable discussing complex medical information in English. However, many medical terms and concepts lack direct translations in local languages, creating communication challenges even when providers attempt to use Kiswahili.

Cultural factors also influenced communication patterns. Traditional respect for authority figures led many patients to avoid questioning healthcare providers or expressing disagreement with treatment recommendations. A 45-year-old female patient from rural Homabay explained: "In our culture, we don't question the doctor. If the doctor says something, we accept it. But sometimes I don't understand what the medicine is for or why I need to take it so many times. Healthcare providers recognised these cultural dynamics but struggled to develop effective strategies for encouraging patient participation. A clinical officer observed: *"Patients will nod and say they understand, but when they return, they didn't follow the treatment plan. They were being polite during the consultation."*

Medical Jargon and Health Literacy Issues

The extensive use of medical jargon has emerged as a significant barrier to effective communication. An analysis of consultation observations revealed that healthcare providers utilised an average of 12.3 medical terms per consultation without offering clear explanations or definitions. Common problematic terms included "*chemotherapy*," "*metastasis*," "*prognosis*," and "*palliative care*," which patients often misunderstood or interpreted incorrectly.

The health literacy assessment revealed that 58% of patients had a limited understanding of basic cancer concepts, including disease progression, treatment mechanisms, and side effect management. This knowledge gap was particularly pronounced among patients with lower educational levels and those from rural backgrounds.

A 42-year-old patient from Kanyaluo provided a representative example:

> *The doctor told me the name of the disease, but I didn't understand it. I just nodded because I didn't want to seem stupid. Later, I asked my daughter to help me find information on the internet, but I still don't understand what's happening to my body* (Personal Communication, Patient).

Climate-Related Barriers and Communication Challenges

Environmental Disruptions to Care Delivery

Climate-related disruptions emerged as a significant factor affecting treatment delivery and patient-provider communication. Power outages, reported by 73% of patients as affecting their care experience, created multiple challenges, including cancelled appointments, compromised medication storage, and disrupted communication systems. Transport barriers caused by extreme weather events impacted 68% of patients from rural areas, with flooding being the most commonly reported concern. These disruptions not only delayed treatment but also instilled anxiety and uncertainty regarding the continuity of care. Another caregiver recounted:

> *We missed two appointments because the road was muddy/ flooded. No one told us what to do in such cases, and the boda boda could not access my home. We just sat at home worrying that the cancer was getting worse while we couldn't get to the hospital* (Personal Communication, Caregiver).

Seasonal patterns in appointment attendance revealed significant variations, with 34% lower attendance rates during peak rainy seasons than dry periods. This pattern was particularly pronounced among patients over 50 kilometres from treatment facilities.

Provider Response to Environmental Challenges

Healthcare providers acknowledged awareness of climate-related challenges but reported limited preparation for addressing these issues in patient communication. Only 30% of providers stated they routinely discussed potential environmental barriers with patients; even fewer (18%) had developed specific protocols for managing climate-related treatment disruptions. A radiation oncologist explained:

> *We know that patients face transportation challenges during the rainy season, but we don't have good systems for managing this. Sometimes patients disappear from care, and we assume they've defaulted, but they might be stuck at home due to poor road networks* (Personal Communication, Radiation Oncologist).

The lack of systematic communication concerning environmental challenges led to information gaps that reduced patients' perceived control over their treatment. Patients facing climate-related disruptions often felt helpless and uncertain about how to address these issues while adhering to their treatment schedule.

Psychological Impact of Environmental Uncertainty

Climate related uncertainties created additional psychological stress for cancer patients, who were already coping with significant illness-related anxiety. The unpredictability of environmental disruptions compounded treatment related stress and reduced patients' confidence in their ability to complete treatment successfully. Qualitative analysis revealed that patients often interpreted environmental barriers as signs that they were not meant to receive treatment or that their situation was hopeless. This fatalistic thinking pattern was particularly prevalent among patients who experienced multiple climate-related treatment disruptions.

A 58-year-old male patient from Suba residing in Homabay town shared:

> *When the road was washed away for the third time, I started thinking that maybe God doesn't want me to get better. Maybe this is my time to die. It's hard to keep fighting when everything seems to be working against you* (Personal Communication, Patient).

Theory of Planned Behaviour Analysis

Attitudes Toward Treatment

The TPB analysis revealed significant relationships between the quality of communication and patients' attitudes towards treatment. Patients who received higher-quality communication demonstrated more positive attitudes towards treatment ($r = 0.67$, $p < 0.001$), a greater understanding of treatment benefits ($r = 0.72$, $p < 0.001$), and more realistic expectations regarding treatment outcomes ($r = 0.58$, $p < 0.01$).

Communication interventions that included clear explanations of treatment rationale, acknowledgement of patient concerns, and provision of emotional support were associated with more positive attitude formation. Conversely, provider-dominated communication characterized by medical jargon and limited patient engagement was associated with more negative attitudes and greater treatment-related anxiety. Patients who received culturally sensitive communication that incorporated local beliefs and values demonstrated positive changes in their attitudes. A traditional healer who later became a cancer patient noted: "When the doctor took time to explain how modern medicine could work together with my traditional understanding of illness, I felt more comfortable accepting the treatment. She didn't dismiss my beliefs but helped me see how both approaches could help me improve."

Subjective Norms and Social Support

Healthcare provider communication approaches significantly influenced subjective norms regarding cancer treatment. Patients whose providers explicitly discussed the importance of family support and community involvement in treatment showed stronger social support networks ($r = 0.54$, $p < 0.01$) and more positive subjective norms regarding treatment adherence ($r = 0.61$, $p < 0.001$).

Communication addressing the cultural stigma surrounding cancer diagnosis and treatment proved particularly effective in reshaping subjective norms. Many patients initially encountered pressure from family and community to pursue traditional healing exclusively, yet healthcare providers who respectfully acknowledged these pressures while elucidating the complementary role of modern medicine achieved greater success in fostering supportive social norms.

A 39-year-old breast cancer patient explained:

> *My mother-in-law kept saying that chemotherapy would make me sicker and that I should only use traditional herbs. But when the doctor took time to explain to my whole family how the treatment works and why it's important, they started supporting me. The doctor even said it was okay for me to continue with some herbs that wouldn't interfere with the medicine* (Personal Communication, Patient).

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Healthcare providers who involved family members and caregivers in communication processes reported better treatment outcomes and fewer adherence problems. However, this approach required additional time and communication skills that many providers felt unprepared to offer. On the other hand, climate-related disruptions significantly threatened perceived behavioural control, especially when patients felt ill-equipped to handle environmental challenges. However, patients whose healthcare providers proactively discussed potential environmental barriers and devised contingency plans maintained higher levels of perceived control despite encountering climate-related disruptions.

A clinical officer described a successful approach:

> *I started asking patients about their transportation situation and what they would do if the road were flooded. We developed backup plans, like identifying alternative routes or arranging temporary accommodation near the hospital. When patients have a plan, they feel more in control and are likelier to continue treatment even when problems arise* (Personal Communication, Clinical Officer).

Successful Communication Strategies and Interventions

Empathetic and Culturally Grounded Approaches

Cases where healthcare providers employed empathetic, culturally grounded communication approaches demonstrated significantly better patient outcomes across multiple measures. These successful interventions shared several common characteristics: acknowledgement of local cultural beliefs and practices, use of simple language with visual aids and analogies, involvement of family members in treatment discussions, and explicit recognition of environmental challenges.

One particularly successful example involved a nurse at the referral hospital who developed a patient education approach using local stories and pictorial representations. She explained: "We started using pictures and local stories to help patients understand their disease and treatment. For example, we compare cancer cells to invasive weeds that need removal from a garden, and chemotherapy to the medicine that helps remove the weeds. That helped the patients understand side effects better and why the treatment sometimes makes them feel worse before they feel better."

This culturally grounded approach resulted in measurably improved patient knowledge scores (mean improvement of 2.3 points on a 5-point scale, $p < 0.001$), more positive treatment attitudes (mean improvement of 1.8 points, $p < 0.01$), and better self-reported adherence (mean improvement of 1.5 points, $p < 0.05$).

Climate-Adaptive Communication Strategies

Healthcare providers who explicitly addressed climate-related challenges in their communication reported improved patient preparedness and maintained treatment continuity despite environmental disruptions. Successful climate-adaptive communication encompassed discussions of seasonal treatment challenges, the development of alternative transportation plans, strategies for medication storage during power outages, and the establishment of communication protocols during emergencies.

A medical oncologist described her approach: "I always ask patients about their living situation and how they get to the hospital. If they live in an area prone to flooding, we talk about what they should do if they can't make it to their appointment. We might arrange extra medication supplies during the rainy season or identify alternative treatment locations if needed. "Patients who received climate-adaptive communication demonstrated better preparedness for environmental challenges (mean preparedness score 4.1 vs. 2.7 for standard care, $p < 0.001$) and were more likely to maintain treatment contact during climate-related disruptions (78% vs. 45%, $p < 0.01$).

Barriers to the Implementation of Effective Communication

Systemic and Institutional Barriers

Despite evidence of effective communication strategies, several systemic barriers hindered the widespread implementation of enhanced communication practices. Time constraints remained the most frequently cited obstacle, with 89% of healthcare providers reporting insufficient time for comprehensive patient communication. Heavy patient loads, averaging 45-60 patients per provider daily, rendered extended communication interactions logistically challenging.

Inadequate communication training emerged as another significant barrier. Only 23% of healthcare providers reported receiving formal training in patient communication skills during their professional preparation, and even fewer (11%) had received training related explicitly to cancer communication or cultural competency. Institutional support for communication improvement was limited, with most healthcare facilities lacking policies, resources, or incentives to enhance patient communication. Performance evaluation systems typically emphasised patient volume and clinical outcomes rather than the quality of communication or measures of patient satisfaction.

Resource and Infrastructure Limitations

Physical infrastructure limitations also hampered the effectiveness of communication. Many consultation rooms lacked privacy, with multiple patients and family members present simultaneously. Noise and interruptions were frequent, making achieving and maintaining focused communication difficult. Educational materials in local languages were limited, compelling providers to depend mainly on verbal communication without visual aids or written reinforcement. Technological resources for patient education, such as videos or interactive materials, were generally absent in study settings. Due to unreliable telecommunications infrastructure, communicating with patients during climate-related disruptions was particularly difficult. Phone networks often failed during extreme weather events, making maintaining patient contact or providing guidance during treatment delays challenging.

Provider-Level Challenges

Individual healthcare providers encountered personal challenges in implementing enhanced communication practices. Numerous providers expressed uncertainty about balancing cultural sensitivity with medical accuracy, particularly when addressing traditional beliefs that may conflict with evidence-based treatment recommendations.

Implications to Research

This study underscores the critical role of doctor-patient communication in cancer care within climate-vulnerable settings like Homabay County. Key barriers include provider-dominated dialogue, excessive jargon, time constraints, and limited patient engagement. Climate-related disruptions, such as floods, power outages, and transport delays, compound these challenges.

Despite these challenges, empathetic and culturally responsive communication significantly improves patient outcomes. Using the Theory of Planned Behaviour (TPB), the study demonstrates that effective communication enhances patients' treatment attitudes, social norms, and perceived control over health outcomes, providing a basis for targeted communication interventions in such contexts.

Theoretical Contributions

This research advances theory by integrating TPB with planetary health to show how environmental stressors affect health communication and behaviour. It highlights how climate-related challenges weaken patients' perceived behavioural control, a key component of health behaviour change. The findings expand planetary health literature to include the impact of environmental change on healthcare delivery and provider-patient interaction.

Policy Recommendations

Education and Training

i. Integrate communication skills into medical and nursing education, with emphasis on cultural sensitivity, health literacy, and climate-adaptive strategies.
ii. Train providers in using interpreters, simplifying information, involving families, and planning for climate disruptions.
iii. Implement regular continuing education using simulations, role-plays, and team-based learning that accommodates clinical schedules.

Health System Strengthening

i. Set clear communication standards (e.g., minimum consultation times, caregiver involvement, communication quality indicators) and incorporate them into policy and performance evaluations.
ii. Improve infrastructure: private consultation rooms, materials in local languages, and communication technologies resilient to environmental disruptions.

Patient and Community Engagement

i. Develop accessible, culturally relevant educational materials addressing climate-related healthcare challenges.
ii. Train and deploy community health workers to reinforce communication, provide local support, and help maintain care continuity during environmental disruptions.

Climate Adaptation

i. Create climate adaptation plans including emergency protocols, alternative treatment delivery methods, and stockpiling resources.
ii. Invest in technology such as backup power systems, telemedicine, and mobile health platforms tailored to low-resource settings.

Future Research Priorities

Future research should prioritize longitudinal studies to track the long-term effects of communication interventions on cancer care outcomes. Randomised controlled trials are needed to establish the causal impact of specific strategies. Implementation science can help identify effective methods for scaling up successful practices, while comparative studies across diverse regions will assess the adaptability of interventions in different cultural and geographic contexts. Additional focus areas should include cost-effectiveness analyses, the role of

technology in climate-resilient communication, and in-depth exploration of patient and provider perspectives on effective communication in climate-stressed settings.

Conclusion

This study emphasises the vital role of effective doctor-patient communication in enhancing cancer care, particularly in climate-vulnerable regions where patients encounter overlapping environmental and social barriers. Despite existing communication gaps, targeted, culturally responsive interventions can significantly improve patient understanding, attitudes, and treatment adherence. The study presents a practical framework for tackling climate-related healthcare challenges by integrating planetary health and behavioural theory. Its findings offer actionable insights for clinicians, policymakers, and researchers dedicated to strengthening cancer care for at-risk populations. Successful implementation will require sustained stakeholder engagement and investment in resilient healthcare systems. However, the benefits—increased patient well-being, system adaptability, and preparedness for future climate impacts—make these efforts necessary and urgent. Immediate action is essential. This study serves as a roadmap for adapting cancer care communication to the realities of a changing climate.

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