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Correlates of self-rated health among BIMA telemedicine customers in Ghana: A cross-sectional survey

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Abstract

Background: Self-rated health (SRH) is a subjective predictor of morbidity and mortality. Nevertheless, little is known about its correlates among telemedicine users in low-resource settings, a population that may face unique health and access challenges.

Objective: The study examined demographic and lifestyle factors associated with SRH among customers of BIMA's telemedicine service in Ghana.

Methods: We analysed cross-sectional secondary data from a telephone survey of BIMA customers (January 2022 – June 2023). Variables included SRH, age, gender, medication use, tobacco use, physical activity (PA), and diet. A composite Healthy Life Score (HLS) combined PA and diet frequency. Multivariable logistic regression was used to examine the association between SRH and its correlates.

Results: Females who formed majority of the 9,547 participants (61.4%) had a mean age of 35.1 (SD 11.6) years, Among them, higher HLS showed a dose–response association with good SRH (Average: aOR = 1.32, 95% CI: 1.06 -1.64; Good: aOR = 1.61, 95% CI: 1.29 – 2.01; Excellent: aOR 2.17, 95% CI: 1.69 – 2.78). Age had a small per-year effect (aOR = 0.99, 95% CI: 0.98 – 0.99), which is meaningful cumulatively, resulting in approximately 10% lower odds over a decade. Men had higher odds than women (aOR = 1.14, 95% CI: 1.05 – 1.24). Medication use (aOR = 0.58, 95% CI: 0.52 – 0.65) and smoking (aOR = 0.70, 95% CI: 0.50 – 0.98) were associated with lower odds of good SRH.

Conclusion: Among BIMA telemedicine users in Ghana, SRH is closely linked to lifestyle and demographic factors. Integrating physical activity promotion, dietary counselling, and smoking cessation support into telemedicine consultations may enhance perceived health. However, findings should be interpreted with caution, given the reliance on self-reported data, non-validated HLS items, and the cross-sectional design of this study.

Keywords: Self-rated health, physical activity, diet, telemedicine, Ghana

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INTRODUCTION

SRH is a subjective assessment of an individual's overall health and has been widely recognised as a strong predictor of morbidity, mortality, and healthcare utilisation [1,2,3,4]. It captures an individual's perception of well-being and is influenced by lifestyle, demographic, and social factors [1,2]. Understanding SRH is particularly relevant in the evolving landscape of healthcare delivery, especially with the rise of telemedicine. In recent years, telemedicine has expanded access to care in regions with limited health infrastructure, offering remote consultations, health monitoring, and personalised health programs [5]. Platforms such as BIMA in Ghana provide 24/7 medical advice, medication support, and wellness services through mobile applications, WhatsApp, and SMS [6,7]. By lowering barriers to access and enabling continuous interaction, telemedicine has the potential to shape health behaviours, such as diet, smoking, and physical activity (PA), which are established predictors of SRH [8,9]. SRH is influenced by several factors, with PA playing a key role

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in preventing and managing non-communicable diseases (NCDs). Epidemiological evidence suggests that regular PA is positively associated with good SRH outcomes [10,11,12]. Conversely, a poor diet, often coupled with physical inactivity, has been linked to increased odds of poorer SRH [13]. A study by Yamada et al. [14] found that deterioration in lifestyle habits, such as reduced exercise, unhealthy diet, and smoking, correlates with lower SRH. Additionally, other factors such as smoking have been consistently associated with poorer SRH outcomes [15]. Demographic factors also contribute to variations in SRH. Advanced age is generally linked to poorer SRH outcomes, while women often report lower SRH than men [16,17,18]. However, most evidence in sub-Saharan Africa has focused on healthcare providers, hospital attendants, or older adults [19,20,21]. Few, if any, studies have examined telemedicine users, a group that may differ from the general population in health-seeking behaviour and access to preventive services. Evidence shows that telemedicine interventions can reduce the burden of chronic diseases, ultimately improving quality of life [22]. Extending such approaches within telemedicine platforms could help address key risk factors such as physical inactivity, smoking, and poor diet, thereby enhancing overall well-being at the population level. This study, therefore, examined the correlates of SRH among BIMA telemedicine customers in Ghana to inform targeted telehealth interventions aimed at improving population health.

MATERIALS AND METHODS

Study design

This study adhered to Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines [23]. A cross-sectional design was employed to examine the association between SRH and its correlates. This design was appropriate as it utilised secondary data without requiring a follow-up period.

Study setting

BIMA Mobile operates as a mobile health insurer across 15 markets spanning Africa, Asia, and Latin America [6]. Established in Ghana in 2010, BIMA launched its telemedicine service in 2015 through the BIMA Doctor application. This service is integrated into insurance policies, offering policyholders unlimited 24/7 consultations with licensed medical professionals. Additionally, the service includes hospital insurance for inpatient care, access to personal medical records, health programs, and medication assistance. These services are accessible via the BIMA Doctor app, WhatsApp, and SMS, with payments processed via interoperable mobile telecommunication platforms. Customers can opt for daily, monthly, or prepaid payment plans [7]. In Ghana, BIMA delivers its telemedicine services to residents in its prime regions (Greater Accra, Ashanti, Volta, Western, and Northern Regions), and a few other selected areas across the country.

Participants and data collection

Between January 2022 and June 2023, BIMA Ghana conducted a market survey among its customers via telephone interviews. The objective was to assess the burden of NCDs within its customer base and gather insights to enhance client support. The survey was conducted by outbound nurses at BIMA assigned to health and wellness. A structured, closed-ended questionnaire was used to collect data on various variables, including age, gender, SRH, PA, diet, medication use, and tobacco use. Customers were interviewed, with no follow-up calls conducted. The current study analysed data from all 9,547 respondents from the survey.

Data analysis

SRH was the primary outcome of this study, serving as an indicator of overall health status and reflecting an individual's perception of their health [24,25]. In the BIMA survey, the question "Over the last 12 months, how would you say your health has been?" with responses "very good", "fair", and "not very good" was used to assess SRH. For analysis, responses were collapsed into two categories: 'not very good' and 'fair' (coded as 0) and 'very good' (coded as 1), with 0 representing poor SRH and 1 representing good SRH. Previous studies have shown that individuals reporting "fair" health have morbidity and mortality risks closer to those reporting "poor" or "not very good" health than to those reporting "good" or "very good" health [26]. The BIMA survey collected data on several potential correlates of SRH, including age (continuous), gender (male/female), medication use (yes/no), and tobacco use (yes/no). PA was assessed with the question: "How often do you exercise?" with responses "once per week or less" (0), "2-3 times per week" (1), or "4 or more times per week" (2). Diet was assessed with the question "How often do you eat a healthy, balanced diet"? With responses "rarely" (0), "some of the time" (1), or "most of the time" (2). We generated a composite Healthy Life Score (HLS) ranging from 0 to 4 from the PA and diet scores, in similar patterns to previous studies [27].

Analysis strategy

All analyses were conducted at a 95% confidence level ($\alpha = 0.05$) using StataCorp. 2023. Stata 18.0 statistical software. Descriptive statistics were presented as means and standard deviations for continuous variables, and frequencies and percentages for categorical variables. To explore gender differences across categorical variables, chi-square tests were conducted. The association between SRH and its correlates was examined using multivariable logistic regression, controlling for potential correlates. Model fit was assessed with the Hosmer–Lemeshow test.

RESULTS

The mean age of participants was 35.1 (SD 11.6) years (Table 1), with the majority being female (61.4%). Statistically significant gender differences were observed across all variables ($p < 0.001$). Regarding HLS, 3.94% of

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participants reported a very poor score, while 22.0% had a good score. A higher proportion of males (24.9%) had a good HLS compared to females (20.2%). Medication use was reported by 20.2% of participants, with males (3%) less likely than females (22.4%) to be on medication ($p < 0.001$). Smoking prevalence was very low (1.57%), but was significantly higher among males (3.0%) than among females (0.6%) ($p < 0.001$). Overall, 52.1% of participants rated their health as poor, with females (53.8%) more likely to report poor SRH compared to males 49.4% ($p < 0.001$). Table 2 presents the logistic regression results identifying factors associated with SRH, with an adequate model fit (Hosmer–Lemeshow $\chi^2 = 13.79$, df = 8, $p = 0.087$). A dose-response relationship was evident for the HLS−SRH association. Compared to those with a very poor HLS, participants with average (aOR: 1.32, 95% CI: 1.06 − 1.64), good (aOR: 1.61, 95% CI: 1.29 – 2.01), and excellent (aOR: 2.17, 95% CI: 1.69 – 2.78) HLS scores had increased odds of good SRH.

Table 1. Characteristics of participants

Variable	Female, n (%)	Male, n (%)	p
	5860 (61.4%)	3687 (38.6%)	
Age in years (SD)	34.5 (11.2)	35.9±12.1	
Healthy Life Score			< 0.001
Very Poor	245 (4.2)	131 (3.6)	
Poor	2003 (34.2)	1019 (27.6)	
Average	1961 (33.5)	1211 (32.8)	
Good	1182 (20.2)	919 (24.9)	
Excellent	469 (8.0)	407 (11.0)	
Medication Use			< 0.001
No	4549 (77.6)	3069 (83.2)	
Yes	1311 (22.4)	112 (3.0)	
Smoking Status			< 0.001
No	5822 (99.4)	3757 (97.0)	
Yes	38 (0.6)	112 (3.0)	
Self-Rated Health			< 0.001
Poor	3153 (53.8)	1820 (49.4)	
Good	2707 (46.2)	1867 (50.6)	

*P-values for the chi-square test, with statistical significance at $p < 0.05$, are bolded

Table 2. Correlates of self-rated health

Variables	OR (95% CI)	aOR (95% CI)
Healthy life score (ref: very poor)	1	1
Poor	0.92 (0.74-1.14)	0.93 (0.75-1.16)
Average	1.26 (1.01-1.56)	1.32 (1.06-1.64)
Good	1.54 (1.23-1.92)	1.61 (1.29-2.01)
Excellent	1.98 (1.55-2.53)	2.17 (1.69-2.78)
Age	0.98 (0.98-0.99)	0.99 (0.98-0.99)
	1	1
Gender (ref: female)	1.20 (1.10-1.30)	1.14 (1.05-1.24)
Male		
Medication Use (ref: no)	1	1
Yes	0.54 (0.49-0.60)	0.58 (0.52-0.65)
Smoking Status (ref: no)	1	1

*OR: Crude Odds Ratio. aOR: Adjusted Odds Ratio CI: Confidence Intervals

Age was inversely associated with SRH (aOR: 0.99, 95% CI: 0.98 – 0.99). Gender differences were observed, with males having 14% increased odds of reporting good SRH than females (aOR: 1.14, 95% CI: 1.05 – 1.24). Medication use was strongly associated with lower SRH, with those on medication having 42% decreased odds of reporting good SRH (aOR: 0.58, 95% CI: 0.52 – 0.65). Similarly, smokers had 30% decreased odds of reporting good SRH compared to non-smokers (aOR: 0.70, 95% CI: 0.50 – 0.98)

DISCUSSION

This study examined the correlates of SRH among BIMA telemedicine customers in Ghana. More than half of participants (52.1%) rated their health as poor, with women more likely than men to do so. A clear dose-response relationship was observed between HLS and SRH, with higher scores associated with good perceived health. Age showed a marginal inverse association with SRH, while medication use and smoking were linked to substantially decreased odds of reporting good health. Together, these findings highlight the role of lifestyle and demographic factors in shaping health perceptions among telemedicine users. Our analysis showed that increasing levels of HLS were positively associated with good SRH, demonstrating a clear dose-response relationship. While some studies have suggested that individuals with healthier lifestyles may still report lower health perceptions [28], most evidence indicates that deterioration of lifestyle habits, particularly reduced PA and poor diet, is linked to poorer SRH [13,14]. In Ghana, Agyemang et al. [29] found that adults who rated their health positively were more likely to engage in both PA and healthy eating, with a significant positive correlation between these behaviours. Similarly, Akwaboah et al. [21] reported that Physician Assistants in the third quartile of leisure-time PA had more than threefold increased odds of reporting good SRH compared with those in the lowest quartile. These findings highlight the importance of promoting PA and healthy diets at the population level. It also reinforces the potential of telemedicine platforms such as BIMA to integrate lifestyle counselling into services, particularly in low-resource settings where in-person healthcare is limited.

The inverse association between age and SRH in this study, although modest per year (aOR = 0.99), becomes meaningful over time, translating into about a 10% decline in the odds of reporting good health across a decade. This finding aligns with evidence that ageing is linked to heightened health concerns and functional limitations, leading to lower SRH ratings [30]. Studies among Chinese and Ghanaian adults found that older individuals reported poorer SRH [18,21]. These findings underscore the importance of tailoring telemedicine interventions to the needs of older users, including chronic disease management

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and support for healthy ageing. Gender disparities in SRH were observed, with men reporting increased odds of good SRH compared to women. This pattern has been consistently noted in previous studies [16]. Both Zhang et al. [18] and Akwaboah et al. [21] found that women were more likely to report poorer SRH in China and Ghana, respectively. Biological, psychological, and social factors, including differences in health-seeking behaviours, disease burden, and societal roles, may influence these disparities. Further research is needed to explore the underlying mechanisms contributing to these gender differences in SRH, particularly within telemedicine user populations.

Tobacco and medication use were also significantly associated with poorer SRH, reinforcing the well-documented negative effects of smoking and chronic disease management on perceived health status [14,15,31]. Although the prevalence of smoking in our sample was very low (1.6%), the observed association remained substantial, with smokers about 30% less likely to report good SRH. This finding should be interpreted with caution, as smoking is often under-reported in population surveys due to social desirability bias. For instance, Owusu-Dabo et al. [32] indicated a self-reported smoking prevalence of 3.8% in Ghana (8.9% in males, 0.3% in females). Similarly, a multi-country analysis across sub-Saharan Africa documented low prevalence and wide gender differences [33]. Medication use was also strongly linked to poorer SRH, which likely reflects underlying chronic disease burden rather than a direct effect of medications. Recent studies have reported that taking multiple or regular medications correlates with poor SRH [34]. Together, these findings underscore the value of telemedicine platforms in providing scalable cessation support and reinforcing chronic disease self-management and lifestyle counselling within routine virtual care.

Implications for Telemedicine and Public Health

The findings of this study highlight the critical role of telemedicine in addressing lifestyle behaviours that strongly influence SRH. With BIMA's 24/7 teleconsultations, practical strategies include structured SMS or WhatsApp reminders to encourage regular PA and balanced diets. Also, smoking-related support that extends beyond cessation to include monitoring, risk education, and encouragement for medical check-ups can help improve customer health. The marginal but cumulative effect of age on SRH underscores the importance of ongoing preventive monitoring for older adults, who may benefit from follow-up calls, medication adherence reminders, and remote tracking of risk factors. Gender differences, with women more likely to report poorer SRH, further emphasise the need for confidential, stigma-free services that promote equitable access to preventive care.

Strengths and limitations

A notable strength of this study is its large sample size (N = 9,547), which enhances the robustness and generalizability of the findings and provides a strong basis for population-level insights. However, several limitations must be acknowledged. Recall bias is a potential concern, as participants' self-reported assessments of SRH, PA, and diet may be subject to inaccuracies. Additionally, the PA and diet questions were not derived from validated instruments. Although we used previous studies that scored behaviour risks in generating a composite HLS score, the psychometric properties were not validated in our study, which may have introduced measurement bias. Unmeasured confounding remains a limitation, as key socioeconomic variables, such as education and income, were unavailable in the dataset and may influence SRH. Furthermore, the cross-sectional design limits the ability to establish causality, making it difficult to determine the temporal relationship between SRH and its correlates. Finally, findings may not be generalisable to the wider Ghanaian population.

Despite these limitations, the study provides valuable insights by assessing the strength of associations between SRH and lifestyle factors, as well as identifying a dose-response relationship between SRH and HLS. These findings serve as a foundation for future research to explore causal mechanisms and develop targeted interventions to improve health outcomes among telemedicine users.

Conclusion

This study identified key demographic and lifestyle correlates of self-rated health among telemedicine users in Ghana. The results emphasise the importance of physical activity, diet, smoking, medication use, age, and gender in shaping perceived health. Telemedicine platforms such as BIMA can play a critical role by integrating lifestyle counselling, reminders for regular check-ups, and tailored support for older adults and women into routine services. Strengthening these preventive functions can help reduce the burden of non-communicable diseases and improve overall well-being in resource-limited settings.

DECLARATIONS

Ethical consideration

The study received ethical approval from the Metropolitan Research and Education Bureau (MREB) with protocol number MREB/RERC/15/24. All collected data were securely stored in accordance with ethical guidelines and data protection regulations.

Consent to publish

All authors agreed on the content of the final paper.

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Competing Interest

The authors declare no conflict of interest.

Author contribution

RL conceptualised the study, curated the data, administered the project, and drafted the manuscript. PA provided formal analysis, supervision, and critical

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revisions. MO contributed to project administration and manuscript review. EAS assisted with data curation and manuscript review. All authors read and approved the final manuscript.

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Availability of data
Data is available on request from the corresponding author.

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