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Young adults' knowledge, attitudes, and practices regarding premarital screening for genetic blood disorders and associated sociodemographic determinants in the Ahafo Region of Ghana: a cross-sectional study

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Abstract

Background Hereditary diseases, particularly genetic blood disorders such as Sickle Cell Disease (SCD), Glucose-6-Phosphate Dehydrogenase (G6PD) deficiency, and Thalassemia, pose significant public health challenges. Premarital carrier screening (PMCS) is a critical preventive measure, yet its uptake remains low in many regions, including the Ahafo Region of Ghana. This study assessed young adults' knowledge, attitudes, and practices (KAP) regarding PMCS for SCD, G6PD deficency, and Thalassemia and determined factors associated with these KAP outcomes in the Ahafo Region.

Methods A cross-sectional study was conducted from January to March 2024, involving 460 young adults aged 18–35 years attending various health facilities in the Ahafo Region. Data were collected using a validated structured questionnaire, translated into the local dialect for clarity. The questionnaire covered socio-demographic information, knowledge of PMCS, attitudes towards PMCS, and PMCS practices. Data were analysed using Stata version 14, with descriptive statistics, Chi-square tests for associations, and logistic regression to identify significant predictors of KAP.

Results The study population was predominantly female (85.7%), with a mean age of 24.7 years. Only 15.4% ($n = 71$) of respondents demonstrated good knowledge of PMCS. Key factors influencing knowledge included female gender, age 26–35 years, tertiary education, and receiving information from healthcare services. Positive attitudes towards PMCS were observed in 66.7% of respondents, significantly associated with tertiary education, self-employment, unemployment, and cohabiting marital status. However, only 14.1% exhibited positive PMCS practices, with significant predictors being tertiary education and being married. These findings indicate a substantial gap between awareness and actual practice of PMCS.

Conclusion This study underscores the urgent need for targeted educational interventions and policy measures to enhance PMCS uptake among young adults in the Ahafo Region. Improving healthcare communication,

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integrating PMCS education into tertiary curricula, addressing sociocultural barriers, and enacting supportive policies are essential steps. Engaging various stakeholders, including healthcare providers, educational institutions, community leaders, policymakers, and NGOs, is crucial for effectively translating positive attitudes into proactive practices and reducing the prevalence of genetic blood disorders in the Ahafo Region and Ghana as a whole.

Keywords Genetic blood disorders, Premarital screening, Knowledge, Attitude, Practice, Sickle cell disease, Glucose 6 phosphate dehydrogenase, Thalassemia, Ahafo region, Ghana

Text box 1. Contributions to the literature

- This study provides novel insights into young adults'knowledge, attitudes, and practices regarding premarital carrier screening (PMCS) for genetic blood disorders in the Ahafo Region of Ghana, a region with limited prior research on this topic.
- Unlike previous studies that primarily assess awareness, this research identifies key demographic and socioeconomic factors associated with knowledge gaps, positive attitudes, and low screening uptake, offering actionable policy recommendations.
- The findings highlight a critical disconnect between positive attitudes and actual PMCS practices, emphasising the need for targeted educational interventions and structural policy measures to improve screening uptake.

Background

Hereditary diseases are among the most significant public health concerns globally, posing challenges to healthcare systems and economic burdens, with costs amounting to at least 2% of total health expenditures [19]. Sickle Cell Disease (SCD) exemplifies this burden, with a global incidence estimated at 112 per 100,000 births, and a significantly higher rate in Africa, where 1125 per 100,000 births are affected [18]. Many countries have between 10 and 40% of the populations carrying the sickle-cell gene, translating to an estimated 2% prevalence of SCD [14].

Every year, over 15,000 (2%) of Ghanaian newborns receive a diagnosis of sickle cell disease [8]. A study conducted at Korle Bu Teaching Hospital through the Ghana Institute of Clinical Genetics reported 20,788 clinic visits from 5,451 adult and adolescent SCD patients, with a gender ratio of 1:1.6. These patients exhibited characteristics such as HbSS (55.7%), HbSC (39.5%), and other forms (4.7%) [8]. SCD, an autosomal-recessive disorder, arises when valine replaces glutamic acid at position 6 of the beta-globin chain, leading to crises including pain, aplasia, splenic sequestration, hemolysis, cerebrovascular accidents, acute chest syndrome, and priapism [8].

Thalassemia is another life-threatening hereditary disorder, prevalent among individuals of Asian, African, and Mediterranean descent. Notably, 20% of Thai individuals and 25–30% of Black individuals carry the α-thalassemia gene [15]. Additionally, glucose-6-phosphate dehydrogenase deficiency (G6PD deficiency) affects approximately 400 million people globally, making it the most common enzyme deficiency in humans. G6PDd accounts for about one-third of male infants with jaundice and is a prevalent cause of neonatal jaundice [17]. The condition is X-linked, resulting in full expression in male hemizygotes and partial expression in heterozygous females [15]. G6PDd is common among individuals of African, Asian, Mediterranean, and Middle-Eastern descent, conferring some antimalarial protection to heterozygotes.

These genetic disorders, such as SCD, G6PD deficiency, and Thalassemia, though life-threatening, are preventable through premarital screening. Premarital screening involves tests for common genetic blood disorders (primary hemoglobinopathies like thalassemia and SCD) and infectious diseases (such as hepatitis B, hepatitis C, and HIV/AIDS) [7]. It helps in preventing the birth of offspring with hereditary diseases and congenital anomalies [5].

In Ghana, there is limited research on knowledge, attitudes, and practices regarding premarital carrier screening for genetic blood disorders. This study aims to assess the knowledge, attitudes, and practices of young adults in the Ahafo Region concerning premarital carrier screening for SCD, G6PD deficiency, and Thalassemia. In the Ahafo Region, the number of sickle cell clients has been rising annually, with 1,293 cases in 2021, 1,117 in 2022, and 767 in 2023 [4]. This increase is partly due to ongoing marriages between carriers or affected individuals who often do not undergo premarital screening [11]. While Ghana and other African countries have implemented newborn screening programs, which have proven to be among the most effective methods of population screening for genetic disorders like sickle cell disease, contributing to improved health outcomes and survival rates for newborns, the nation lacks stringent regulations for premarital screening programs [3]. As a result, premarital screening remains voluntary, with individuals utilizing it only when they choose to and as much as they can afford. This study aims to fill the gap in understanding and attitudes towards premarital carrier screening in the Ahafo Region of Ghana and to promote awareness to help address the associated lifelong healthcare costs and disease burden.

Methods

Study design

This study employed a cross-sectional design to assess the knowledge, attitudes, and practices of premarital genetic screening among young adults in the Ahafo Region. The cross-sectional design was chosen as it is well-suited for capturing a snapshot of the participants'current knowledge, attitudes, and practices regarding premarital screening of genetic blood disorders at the time of the research, which took place between January 2024 and March 2024.

Study setting

The Ahafo Region (Fig. 1), established on February 13, 2019, with Goaso as its capital, serves as the setting for this study. The Regional Health Directorate is located in Hwidiem. As of the 2021 housing and population census, the region has an estimated population of 588,633, reflecting a 2.1% annual growth rate. Agriculture and related fields are the predominant occupations in the region. Situated within Ghana's forest belt, the Ahafo Region is largely covered with grassland and fertile soil. It features savanna, a drought-resistant flora, and pockets of drought-tolerant trees like acacias and baobabs. The region comprises six districts and 27 sub-districts, with a total of 117 health institutions, including 13 hospitals (6 Government, 2 Christian Health Association of Ghana (CHAG), 1 Islamic, and 4 private), 22 health centres (21 government and 1 private), 17 clinics (4 government, 5 CHAG, and 8 private), 3 private maternity homes, and 62 CHPS compounds. The region has a doctor-to-population ratio of 1:13,307 and a nurse-to-population ratio of 1:339.

Study population and sample size

The study targeted young adults aged 18–35 in the Ahafo Region who were attending various health facilities in the different districts and sub-districts during the study period and were willing to participate. This age group was chosen because individuals within 18- 35 years age range is widely supported in public health and demographic literature. For instance, the World Health Organization (WHO) and the United Nations define young adults as individuals aged 18–35 years, as this period marks a crucial transition from adolescence to full adulthood, encompassing key life events such as higher education, employment, marriage, and family planning [16]. Participants who consented after having the study objectives explained to them in either English or the local dialect were included in the study.

The sample size was determined using Cochran's formula for a single population proportion:

$n = Z^2 pq/d^2$, where Z is the normal deviate (1.96 for a 95% confidence level), p is the estimated proportion (set at 50% for maximum sample size), and d is the margin of error (0.05). Using these parameters, the calculated sample size was 384 participants. To account for potential non-response, the sample size was increased by 20%, resulting in a final sample size of 460 young adults.

Sampling strategy

Participants in this study were selected from health facilities at various levels of care in the Ahafo Region using a multi-stage sampling method.

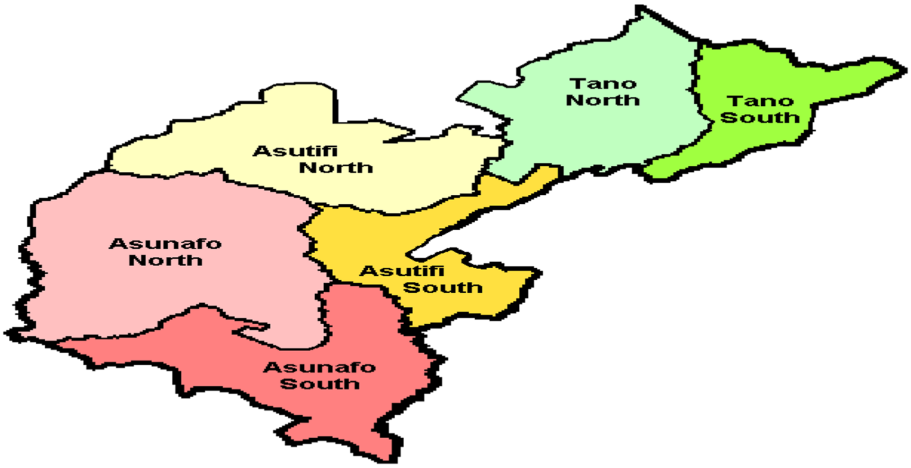

Fig. 1 Map of Ahafo Region. Source: [12]

- Stage One: A simple random sampling method (by ballot) was used to select three out of the six districts in the region. The selection of three districts was based on resource feasibility, population distribution, and accessibility. Given logistical constraints and the need for a representative yet manageable sample size, selecting three districts allowed for a balanced geographical spread while ensuring effective data collection within the study's timeframe and available resources. The selected districts—Tano North, Asunafo North, and Asutifi South—were chosen to reflect diverse healthcare access patterns and sociodemographic variations in the region.
- Stage Two: Ten health facilities with different levels of care were selected through balloting. These included two hospitals, two clinics, five health centers, and one private maternity home to ensure a broad representation of healthcare service utilization among young adults.
- Stage Three: From each selected facility, 46 participants were recruited using a convenience sampling method (first-come, first-served basis). Eligibility criteria included adults aged 18–35 years who visited the selected health facilities, agreed to participate in the study, and provided informed consent. Critically ill (including mentally ill) patients were excluded.

Data collection

Data for this study were collected using a validated structured questionnaire adapted from Al-Kindi et al. [6]. The questionnaire was refined to align with the study's objectives by making minor modifications to the demographic section and incorporating specific adjustments related to the three genetic disorders: SCD, G6PD deficiency, and Thalassemia. Additional and modified contents of the tool were validated by soliciting insights from subject-matter experts, including those from the Kintampo Health Research Centre (KHRC), to ensure content relevance and accuracy. To assess the effectiveness of each item in measuring the intended construct, item analysis techniques were employed. Based on the findings, necessary revisions or replacements were made to enhance the tool's precision. This process was iteratively repeated to confirm that the questionnaire consistently measured the construct with reliability and validity. Trained research assistants assisted the principal investigator in administering the piloted questionnaire to respondents. To ensure linguistic clarity and accuracy, the questions were first translated into the local dialect (Twi) and then back-translated into English.

The adapted questionnaire was employed to collected data on respondents' socio-demographic information, including gender, age, ethnicity, marital status, level of education, monthly income, employment status, personal history of hereditary disease, family history of hereditary disease, and the type of relationship between their parents. Additionally, data on respondents' knowledge of premarital genetic screening (PMCS), including general information about PMCS, SCD, G6PD deficiency, and Thalassemia were collected. This covered aspects such as inheritance patterns, diagnosis, signs and symptoms, treatment, and prevention.

Further data were collected on respondents' attitudes and practices toward PMCS, SCD, G6PD deficiency, and Thalassemia, as well as their perceived benefits of and barriers to premarital genotype screening. Potential respondents visiting the selected healthcare facilities who met the inclusion criteria were approached and invited to participate by either the principal investigator or the research assistants. The study rationale was explained to them, and the questionnaire was administered upon obtaining their consent to participate.

Data analysis

Data obtained were validated through double entry and random checks and analysed using Stata version 14 (Stata Corp. LLC, Texas, USA). The data were cleaned, recoded, and scores were assigned. Categorical data were presented using descriptive statistics, including frequency tables and percentages. Associations between categorical variables were tested using the Chi-square (X^2) test. Differences in continuous data were determined using the student's t-test for bivariate analysis.

Each questionnaire was manually graded to obtain three scores: knowledge score, attitudes score, and practices score. Based on these scores, the frequencies of good and poor KAP (knowledge, attitudes, and practices) were obtained using descriptive statistics (frequencies and percentages). The correlation between the knowledge score, attitudes score, and practices score was assessed using the student's t-test to obtain a *p*-value. Logistic regression was used to assess the association between demographic factors and the total KAP classification scores.

Scoring system

To evaluate knowledge, a composite knowledge score was calculated based on 23 knowledge-related questions covering awareness, transmission, symptoms, diagnosis, treatment, and prevention of genetic blood disorders. Each correct response was awarded 1 point, while incorrect or"don't know"responses received 0 points. The maximum possible knowledge score was 23 points.

The knowledge classification was determined using a percentage-based approach, as follows:

Good knowledge: ≥ 52% (12 or more correct answers out of 23)
Poor knowledge: ≤ 48% (11 or fewer correct answers out of 23)
For attitudes and practices, responses were categorized using similar percentage thresholds:

Attitude Score: Based on 8 attitude-related questions, where each correct response scored 1 point (maximum score: 8).

Positive Attitude: ≥75% (6 or more correct answers out of 8)
Negative Attitude: ≤63% (5 or fewer correct answers out of 8)

Practice Score: Based on 8 practice-related questions, where each correct response scored 1 point (maximum score: 8).

Positive Practice: ≥62.5% (5 or more correct answers out of 8)
Poor Practice: ≤ 50% (4 or fewer correct answers out of 8)

The cut-off points were based on prior literature in similar studies [6, 13] and adapted for this study context.

Results

Socio-demographic characteristics of the study respondents

Of the 460 respondents, most were female (*n*= 394; 85.7%), and the majority were aged between 18 and 25 years (*n*= 272; 59.1%) with a mean age of 24.7 ±4.7 years. Of the 460 respondents, the majority were single (*n*= 264; 57.4%), Akans (*n*= 379; 82.4%), had tertiary education (*n*= 203; 44.1%), and were unemployed (*n*= 242; 52.6%). For most (63,7%) of the 460 respondents, their monthly incomes were < 500 Ghana cedis (Table 1).

Table 1 Socio-demographic characteristics of 460 young adult respondents aged 18–35 years in the Ahafo Region of Ghana in a study on premarital screening for genetic blood disorders, January–March 2024

Variable	Category	Frequency (%)
Sex	Male	66 (14.4)
	Female	394 (85.7)
Age	18–25	272 (59.1)
	26–35	188 (40.9)
Ethnicity	Akan	379 (82.4)
	Ewe	21 (4.6)
	Ga	5 (1.1)
	Northern Tribes	55 (11.9)
Marital Status	Cohabiting	108 (23.5)
	Divorced	2 (0.4)
	Married	84 (18.3)
	Single	264 (57.4)
	Widowed	2 (0.43)
Education	JHS OR Below	153 (33.3)
	SHS	104 (22.6)
	Tertiary and above	203 (44.1)
Monthly Income	< 500	293 (63.7)
	500–1000	56 (12.2)
	> 1000	111 (24.1)
Employment	Employed	94 (20.4)
	Self Employed	124 (26.9)
	Unemployed	242 (52.6)

Presented as frequencies with appropriate percentages in parenthesis

Source: Field Data

Respondent's knowledge of Premarital carrier screening of genetic blood disorders

Table 2 shows the respondents'knowledge about premarital carrier screening (PMCS). The total knowledge score indicated that 15.4% (*n*= 71) of respondents had good knowledge of PMCS, while 84.6% (*n*= 389) had poor knowledge (Supplementary Table 1). Key areas of knowledge included awareness of PMCS programmes in Ghana (*n*= 340; 73.9%), understanding who should be screened (*n*= 396; 86.1%), knowledge of disorders targeted by PMCS (*n*= 245; 53.3%), awareness of the psychological burden on families (*n*= 252; 54.8%), familiarity with SCD (*n*= 399; 86.7%) and its signs and symptoms (*n*= 286; 62.2%), and the belief that PMCS can reduce the spread of SCD (*n*= 347; 75.4%) and G6PD deficiency (*n*= 235; 51.1%).

Conversely, areas with less knowledge included those who had not heard about G6PD deficiency (*n*= 378; 82.2%) and Thalassemia (*n*= 398; 86.5%), and those unaware of their status for SCD (n =294; 63.9%), G6PD deficiency (*n*= 418; 90.9%), and Thalassemia (*n*= 441; 95.9%). Many respondents were not knowledgeable about how these disorders are transmitted: SCD (*n*= 310; 67.4%), G6PD deficiency (*n*= 409; 88.9%), and Thalassemia (*n*= 429; 93.3%). Additionally, a significant number were unfamiliar with the signs and symptoms of G6PD deficiency (*n*= 414; 90.0%) and Thalassemia (*n*= 437; 95.0%), and the treatment of SCD (*n*= 375; 81.5%), G6PD deficiency (*n*= 427; 92.8%), and Thalassemia (*n*= 443; 96.3%).

Association of respondents' demographic characteristics and their knowledge of PMCS of genetic blood disorders

Statistical analysis showed the mean score for the good knowledgeable group was significantly higher than that

Table 2 Knowledge of premarital screening for genetic blood disorders among 460 young adult respondents in the Ahafo Region of Ghana, January–March 2024

Variable	Yes Frequency (%)	No Frequency (%)
Availability of PMCS programme in Ghana	340 (73.9)	120 (26.1)
Who should be screened	396 (86.1)	64 (13.9)
Components of PMCS	230 (50.0)	230 (50.0)
Disorders targeted by PMCS	245 (53.3)	215 (46.7)
Psychological burden of hereditary diseases on families	252 (54.8)	208 (45.2)
Have you heard of SCD	399 (86.7)	61 (13.3)
Have you heard of G6PD	82 (17.8)	378 (82.2)
Have you heard of Thalassemia	62 (13.5)	398 (86.5)
Do you know your status for SCD	166 (36.1)	294 (63.9)
Do you know your status for G6PD	42 (9.1)	418 (90.9)
Do you know your status for Thalassemia	19 (4.1)	441 (95.9)
Transmission of SCD	150 (32.6)	310 (67.4)
Transmission of G6PD	51 (11.1)	409 (88.9)
Transmission of Thalassemia	31 (6.7)	429 (93.3)
Signs and symptoms of SCD	286 (62.2)	174 (37.8)
Signs and symptoms of G6PD	46 (10.0)	414 (90.0)
Signs and symptoms of Thalassemia	23 (5.0)	437 (95.0)
Treatment of SCD	85 (18.5)	375 (81.5)
Treatment of G6PD	33 (7.2)	427 (92.8)
Treatment of Thalassemia	17 (3.7)	443 (96.3)
Can PMCS reduce the spread of SCD	347 (75.4)	113 (24.6)
Can PMCS reduce the spread of G6PD	235 (51.1)	225 (48.)
Can PMCS reduce the spread of Thalassemia	226(49.1)	234 (50.9)
Total Knowledge classification	71(15.4)	389 (84.6)

SCD Sickle Cell Disease, *G6PD* Glucose 6 Phosphate Dehydrogenase, *PMCS* Premarital Carrier Screening. Variables are presented in frequency with percentages in parenthesis

Source: Field data

for the poor knowledgeable group, with a mean difference (Diff) of 54.7. The 95% confidence interval (C.I.) for the good knowledgeable group was 106.9 to 220.3, while for the poor knowledgeable group, was 239.7 to 353.1 with a p-value of 0.0007 indicating a statistically significant difference, suggesting a substantial disparity in knowledge between the two groups (Supplementary Table 1).

There was a significant association (*p-value*= 0.001) between gender and knowledge at the PMCS level. Females exhibited an odds ratio (OR) of 8.2 (95% CI =2.4—27.6), indicating that they were significantly more likely to be knowledgeable in PMCS compared to their male counterparts. Respondents aged 26 to 35 exhibited higher knowledge levels, with an OR of 2.5 (95% CI =1.0—6.2), compared to those in the 18 to 25 age group (*p*-value =0.049). Regarding education, respondents who had tertiary education and above demonstrated significantly higher knowledge levels (p-value =0.001), with an OR of 11.7 (95% CI =2.9—47.1) compared to other educational categories. Respondents who obtained information from healthcare services were 2.4 times more likely to be knowledgeable (OR =2.4, 95% CI =1.2—5.03) than those who obtained information from other sources (*p*-value =0.019). Respondents with parents in a cousin relationship showed a higher likelihood of being knowledgeable, with OR of 2.4 (95% CI =1.2—5.1), compared to those with parents in distant relationships (*p*-value =0.017) (Table 3).

Respondent's attitude towards premarital carrier screening of genetic blood disorders

Table 4 presents the attitudes of respondents towards PMCS. Of the 460 respondents, 66.7% (*n*= 307) had positive attitudes, while 33.3% (*n*= 153) had negative attitudes. Positive attitudes were reflected in the belief in the importance of PMCS (*n*= 402; 87.4%), agreement to undergo PMCS (*n*= 407; 88.5%), willingness to undergo PMCS before marriage (*n*= 429; 93.3%), recognising the importance of PMCS for both themselves and their spouse (*n*= 415; 90.2%), support for making PMCS mandatory in the country (*n*= 343; 74.6%), and agreeing on

Table 3 Association between socio-demographic characteristics and knowledge of premarital screening for genetic blood disorders among young adult respondents in the Ahafo Region of Ghana, January–March 2024

Demographic characteristic		N	Odds Ratio	95% C. I	*p-value*
Sex					
	Male	66 (14.4)	(Ref)	(Ref)	(Ref)
	Female	394 (85.6)	8.2	(2.4, 27.6)	0.001
Age Group					
	18–25	272 (59.1)	(Ref)	(Ref)	(Ref)
	26–35	188 (40.9)	2.5	(1.0,6.2)	0.049
Ethnic Classification					
	Akan	379 (82.4)	0.8	(0.4,1.9)	0.649
	Other Tribes	81 (17.6)	(Ref)	(Ref)	(Ref)
Marital Status					
	Single	268 (58.2)	(Ref)	(Ref)	(Ref)
	Cohabiting	108 (23.5)	0.3	(0.1,1.0)	0.058
	Married	84 (18.3)	0.6	(0.3,1.6)	0.363
Education					
	JHS Or below	153 (33.3)	(Ref)	(Ref)	(Ref)
	SHS	104 (22.6)	1.9	(0.4,8.8)	0.393
	Tertiary and above	203 (44.1)	11.7	(2.9,47.1)	0.001
Monthly Income					
	< 500	293 (63.7)	0.6	(0.2,2.5)	0.502
	500–1000	56 (12.2)	(Ref)	(Ref)	(Ref)
	> 1000	111 (24.1)	0.7	(0.2,2.5)	0.564
Employment					
	Employed	94((20.4)	(Ref)	(Ref)	(Ref)
	Self Employed	124(27.0)	0.4	(0.2,1.1)	0.081
	Unemployed	242(52.6)	0.7	(0.2,3.0)	0.666
Personal History					
	Yes	31 (6.7)	0.5	(0.1, 2.3)	0.357
	No	388(84.4)	0.3	(0.1, 1.1)	0.075
	Don't Know	41 (8.9)	(Ref)	(Ref)	(Ref)
Family History					
	Yes	53(11.5)	2.1	(0.5, 9.1)	0.090
	No	320(69.6)	2.9	(0.8, 9.9)	0.090
	Don't Know	87(18.9)	(Ref)	(Ref)	(Ref)
Parent Relation Classification					
	Cousins	72(15.6)	2.4	(1.2, 5.1)	0.017
	Distant	388(84.4)	(Ref)	(Ref)	(Ref)
Source of Information					
	Family and Friends	233(50.7)	(Ref)	(Ref)	(Ref)
	Healthcare Services	128 (27.8)	2.4	(1.2, 5.0)	0.019
	Media and Newspapers	67 (14.6)	0.4	(0.1, 1.8)	0.245
	School Subjects	32(6.9)	1.3	(0.4, 4.1)	0.631

Ref Reference, *C.I* Confidence interval, *JHS* Junior High School, *SHS* Senior High School, $p < 0.05$ was considered statistically significant

Source: Field data

the need for laws and regulations for PMCS ($n = 243$; 52.8%). The only variable indicating a negative attitude was the willingness to proceed with marriage regardless of PMCS results ($n = 275$; 59.8%).

Association of respondents demographic characteristics and attitude towards PMCS of genetic blood disorders

Statistical analysis showed the mean score for respondents with positive attitudes was significantly higher than

Table 4 Attitudes toward premarital screening for genetic blood disorders among 460 young adult respondents in the Ahafo Region of Ghana, January–March 2024

Variable	Positive Attitudes Frequency (%)	Negative Attitudes Frequency (%)
Importance of PMCS	402 (87.4)	58 (12.6)
Agree to undergo PMCS?	407 (88.5)	53 (11.5)
Response to PMCS if your children could be affected	232 (50.4)	228 (49.6)
When to do PMCS	429 (93.3)	31 (6.7)
Importance of PMCS for you and your spouse	415 (90.2)	45 (9.8)
If future spouse is a carrier, will you go on with the marriage	185 (40.2)	275(59.8)
Do you agree with making PMCS mandatory?	343 (74.6)	117(25.4)
Do you agree with putting laws and regulations	243(52.8)	217(47.2)
Total Attitudes classification	307 (66.7)	153 (33.3)

PMCS Premarital Carrier Screening. Variables are presented in frequency with percentages in parenthesis

Source: Field data

those with negative attitudes, with a mean difference (Diff) of 48.7. The 95% C.I. for the positive attitudes group was 250.5 to 413.5, whereas for the negative attitudes group was 46.5 to 209.5, with a *p*-value of 0.0005 which indicates statistically significant difference between the two groups in terms of their attitudes towards premarital carrier screening (Supplementary Table 2).

There was a significant association between education and attitudes towards PMCS. Respondents with tertiary education ($p = 0.005$) were 2.3 times more likely (OR =2.3, 95% CI =1.3—4.0) to exhibit a positive attitude towards PMCS compared to those with lower educational attainment (SHS and JHS levels). Regarding employment status, self-employed respondents ($p = 0.013$) and unemployed respondents ($p = 0.001$) were 0.4 times (95% CI =0.2—0.8) and 0.3 times (95% CI =1.1—0.5) more likely to show a positive attitude towards PMCS than those who were employed. Notably, among marital statuses, respondents who were cohabiting ($p = 0.016$) were 0.5 times (95% CI =0.3—0.9) more likely to express positive attitudes towards PMCS compared to their married and single counterparts (Table 5).

Respondents' practices regarding PMCS of genetic blood disorders

Table 6 presents the levels and variables of respondents'practices regarding PMCS. Of the 460 respondents, the total practice score showed that 14.1% ($n = 65$) had positive practices, while 85.9% ($n = 395$) had negative practices. Positive practices included advising their spouse to undergo PMCS ($n = 428$; 93.0%), willingness to take a PMCS test in the future ($n = 420$; 91.3%), and the intention of unmarried respondents to undertake premarital screening before marriage ($n = 337$; 89.6%). Negative practices, ranked in descending order, included never having tested for Thalassemia ($n = 446$; 97.0%), G6PD ($n = 421$; 91.5%), not having undertaken PMCS ($n = 396$; 86.1%), and never having tested for SCD ($n = 303$; 65.9%).

Association between respondents' demographic characteristics and their practices regarding PMCS of genetic blood disorders

The mean score for respondents with positive practices was higher compared to those with negative practices, with a mean difference (Diff) of 116.6. The 95% C.I. for the positive practices group ranged from 87.8 to 387.7, and for the negative practices group, it ranged from 17.7 to 311.8, with a p-value of 0.21 indicating no statistically significant difference in the practices regarding PMCS between respondents with positive and negative practices.

Significant associations were found with educational level and marital status. Respondents with tertiary education or higher ($p = 0.003$) were 7.7 times more likely (OR =7.7, 95% CI =2.0—30.0) to practice PMCS compared to those with only SHS or JHS education. Additionally, married respondents ($p = 0.0001$) were 5.1 times more likely (OR =5.1, 95% CI =2.1—12.6) to practice PMCS than their cohabiting or single counterparts (Table 7).

Discussion

This study examined the knowledge, attitudes, and practices (KAP) of young adults in the Ahafo Region regarding premarital screening for genetic blood disorders such as Sickle Cell Disease (SCD), Glucose-6-Phosphate Dehydrogenase (G6PD) deficiency, and Thalassemia and identified factors associated with these outcomes. The

Table 5 Association between socio-demographic characteristics and attitudes toward premarital screening for genetic blood disorders among young adult respondents in the Ahafo Region of Ghana, January–March 2024

Factors	N (%)	Odds Ratio	95% C.I	*p-value*
Sex				
Male	66 (14.4)	(Ref)	(Ref)	(Ref)
Female	394 (85.6)	1.2	(0.7, 2.3)	0.473
Age Group				
18–25	272 (59.1)	(Ref)	(Ref)	(Ref)
26–35	188 (40.9)	1.1	(0.6, 1.9)	0.807
Ethnic Classification				
Akan	379 (82.4)	0.9	(0.5, 1.5)	0.597
Other Tribes	81 (17.6)	(Ref)	(Ref)	(Ref)
Marital Status				
Single	268 (58.2)	(Ref)	(Ref)	(Ref)
Cohabiting	108 (23.5)	0.5	(0.3,0.9)	0.016
Married	84 (18.3)	0.6	(0.3,1.2)	0.184
Education				
JHS Or below	153 (33.3)	(Ref)	(Ref)	(Ref)
SHS	104 (22.6)	1.4	(0.8, 2.5)	0.208
Tertiary And above	203 (44.1)	2.3	(1.3, 4.0)	0.005
Monthly Income				
< 500	293 (63.7)	1.4	(0.7, 3.2)	0.331
500–1000	56 (12.2)	(Ref)	(Ref)	(Ref)
> 1000	111 (24.1)	0.8	(0.4, 1.7)	0.536
Employment				
Employed	94 (20.4)	(Ref)	(Ref)	(Ref)
Self Employed	124 (27.0)	0.4	(0.2, 0.8)	0.013
Unemployed	242 (52.6)	0.3	(0.1, 0.6)	0.001
Personal History				
Yes	31 (6.7)	1.2	(0.4, 3.5)	0.743
No	388 (84.4)	1.5	(0.7, 3.2)	0.328
Don't Know	41 (8.9)	(Ref)	(Ref)	(Ref)
Family History				
Yes	53 (11.5)	0.9	(0.4, 2.1)	0.897
No	320 (69.6)	1.1	(0.6, 2.0)	0.724
Don't Know	87 (18.9)	(Ref)	(Ref)	(Ref)
Parent Relation Clasification				
Cousins	72 (15.6)	1.0	(0.5, 1.9)	0.996
Distant	388 (84.4)	(Ref)	(Ref)	(Ref)
Source of Information				
Family And Friends	233 (50.7)	(Ref)	(Ref)	(Ref)
Healthcare Services	128 (27.8)	1.0	(0.6, 1.7)	0.924
Media And Newspapers	67 (14.6)	0.6	(0.3, 1.0)	0.065
School Subjects	32 (6.9)	0.5	(0.2,1.3)	0.162

Ref Reference, *C.I* Confidence interval, *JHS* Junior High School, *SHS* Senior High School, $p < 0.05$ was considered statistically significant

Source: Field data

findings indicate that while 66.7% of respondents exhibited positive attitudes toward premarital screening, only 19.8% had good knowledge, and 14.1% engaged in positive screening practices. Key factors associated with better knowledge included female gender, tertiary education, and obtaining information from healthcare services, while positive attitudes were influenced by education, employment status, and cohabiting marital status. However, the gap between positive attitudes and low screening practice highlights barriers to translating awareness into action.

These findings align with previous research. For instance, Brown et al. [9] found that while many Ghanaian university students were aware of premarital genotype screening, less than half (47%) understood its role in preventing SCD. Similarly, a study in Nigeria by Adigwe et al. [2] reported low awareness levels despite a willingness to undergo screening [1]. This underscores the critical role of education and healthcare communication in promoting premarital screening uptake.

Despite the predominantly positive attitudes observed in this study, the low engagement in screening practices suggests structural and sociocultural barriers. Felix et al. [11] reported similar trends in Ghana, where the uptake of premarital screening remained low despite awareness of its benefits. Barriers such as limited accessibility, cost, and sociocultural norms may contribute to the gap between awareness and practice. Addressing these barriers through improved healthcare access, public education initiatives, and policy interventions is crucial for increasing screening uptake [11].

Furthermore, our study highlights the association between tertiary education and positive KAP regarding premarital screening. Higher education levels were linked to better knowledge and attitudes, consistent with findings from Al-Shafai et al. [7] in Qatar and Faremi [10] in Nigeria, where educational attainment played a key role in shaping perceptions and behaviours related to genetic screening.

In addition to education, marital status influenced screening practices, with married individuals more likely to have undergone PMCS. This suggests that while screening awareness may be high among unmarried individuals, screening may not be prioritised until marriage plans are imminent. Similar patterns were observed in studies by Felix et al. [11] and Adigwe et al. [2], emphasising the need for early education and routine screening programmes to shift screening behaviour from reactionary to preventive.

The findings of this study revealed a concerning gap in KAP regarding PMCS among young adults in the Ahafo Region which requires multi-level interventions, including enhanced public education, improved access

Table 6 Practices regarding premarital screening for genetic blood disorders among 460 young adult respondents in the Ahafo Region of Ghana, January–March 2024

Variable	Positive practices Frequency (%)	Negative practices Frequency (%)
Have you undertaken premarital carrier screening?	64 (13.9)	396 (86.1)
If married, when did you undertake premarital screening	42 (50.0)	42 (50.0)
If unmarried, when would you like undertake premarital screening	337 (89.6)	39 (10.4)
Have you tested for SCD	157 (34.1)	303 (65.9)
Have you tested for G6PD	39 (8.5)	421 (91.5)
Have you tested for Thalassemia	14 (3.0)	446 (97.0)
Are you willing to do premarital screening test in the future	420 (91.3)	40 (8.7)
Will you advise your future spouse to do PMCS	428 (93.0)	32 (7.0)
Total Practices classification	65 (14.1)	395 (85.9)

SCD Sickle Cell Disease, *G6PD* Glucose 6 Phosphate Dehydrogenase, *PMCS* Premarital Carrier Screening. Variables are presented in frequency with percentages in parenthesis

Source: Field data

to screening facilities, and stronger policy support. For instance, with only 19.8% of respondents demonstrating adequate knowledge, despite 66.7% exhibiting positive attitudes towards PMCS, the low practice rate of 14.1% highlights a critical disconnect between awareness and action. If left unaddressed, this gap could perpetuate the prevalence of genetic blood disorders such as SCD, G6PD deficiency, and Thalassemia. The significant associations with tertiary education, employment status, and marital status suggest that targeted educational interventions and policy measures are essential. Without such efforts, the region and Ghana as a whole may continue to experience high rates of these preventable conditions, leading to increased healthcare costs, emotional and psychological burdens on families, and overall societal impact. Therefore, it is imperative to enhance PMCS education, improve access to screening services, and foster supportive policies to bridge this gap and mitigate the consequences of genetic blood disorders.

To this end, this study's authors recommend several targeted interventions (including enhancing healthcare service communication, integrating PMCS education into tertiary curricula, addressing sociocultural barriers, and government and policy interventions) and the involvement of various stakeholders including Non-Governmental Organisations (NGOs) and Media to address these gaps. Healthcare providers in the Ahafo Region might need further training to improve their communication skills regarding PMCS. This may include offering counselling services that explain the benefits of premarital screening and providing accessible educational materials in both English and local dialects. Regular workshops and seminars could be organised for both healthcare workers and the general public to disseminate accurate information about genetic blood disorders and the importance of PMCS [11]. Also, educational institutions, particularly universities and colleges, should consider incorporating PMCS education into their health and science programmes. This integration will ensure that young adults are equipped with the necessary knowledge before they reach marriageable age. In addition, collaborations between educational institutions and healthcare organisations can facilitate the development of comprehensive PMCS modules [9]. Furthermore, sociocultural factors play a significant role in the acceptance and practice of PMCS. Community leaders, religious organisations, and local influencers can be engaged to promote the benefits of PMCS. Culturally sensitive educational campaigns that respect local traditions and beliefs can help reduce stigma and misconceptions about genetic screening. Storytelling, drama, and community gatherings could be effective methods to convey these messages [2]. Moreover, the government and policymakers (e.g., the Ministry of Health) in Ghana should consider making PMCS a mandatory part of the premarital process. Legislation and policies that support PMCS can ensure wider adoption and compliance. Additionally, subsidies or financial assistance programs could be introduced to make screening more affordable for all socioeconomic groups [7]. NGOs can play a pivotal role in bridging the knowledge gap by conducting outreach programmes and providing resources for PMCS education. Media outlets, including radio, television, and social media, should be leveraged to run awareness campaigns and share success stories of couples who have benefited from PMCS [10]. Comparing these results with studies from other regions underscores the universal challenge of translating knowledge and attitudes into

Table 7 Association between socio-demographic characteristics and practices of premarital screening for genetic blood disorders among young adult respondents in the Ahafo Region of Ghana, January–March 2024

Factors	N	Odds Ratio	95% C. I	*p-value*
Sex				
Male	66 (14.4)	(Ref)	(Ref)	(Ref)
Female	394 (85.6)	0.9	(0.3, 2.2)	0.746
Age Group				
18–25	272 (59.1)	(Ref)	(Ref)	(Ref)
26–35	188 (40.9)	1.5	(0.6, 3.8)	0.435
Ethnic Classification				
Akan	379 (82.4)	1.6	(0.6, 4.4)	0.345
Other Tribes	81 (17.6)	(Ref)	(Ref)	(Ref)
Marital Status				
Single	268 (58.2)	(Ref)	(Ref)	(Ref)
Cohabiting	108 (23.5)	0.5	(0.1, 2.0)	0.349
Married	84 (18.3)	5.1	(2.1, 12.6)	0.0001
Education				
JHS Or below	153 (33.3)	(Ref)	(Ref)	(Ref)
SHS	104 (22.6)	2.9	(0.6, 13.1)	0.162
Tertiary And above	203 (44.1)	7.7	(2.0, 30.0)	0.003
Monthly Income				
< 500	293 (63.7)	1.0	(0.2, 5.7)	0.982
500–1000	56 (12.2)	(Ref)	(Ref)	(Ref)
> 1000	111 (24.1)	3.9	(0.9, 17.4)	0.076
Employment				
Employed	94 (20.4)	(Ref)	(Ref)	(Ref)
Self Employed	124 (27.0)	0.5	(0.2, 1.3)	0.158
Unemployed	242 (52.6)	1.6	(0.3, 7.5)	0.551
Family History				
Yes	53 (11.5)	2.9	(0.54, 15.7)	0.212
No	320 (69.6)	2.5	(0.6, 9.8)	0.205
Don't Know	87 (18.9)	(Ref)	(Ref)	(Ref)
Parent Relation Classification				
Cousins	72 (15.6)	1.3	(0.5, 3.0)	0.592
Distant	388 (84.4)	(Ref)	(Ref)	(Ref)
Source of Information				
Family And Friends	233 (50.7)	(Ref)	(Ref)	(Ref)
Healthcare Services	128 (27.8)	1.3	(0.6, 3.1))	0.475
Media And Newspapers	67(14.6)	0.4	(0.1, 1.9)	0.246
School Subjects	32 (6.9)	0.7	(0.2, 2.6)	0.565

Ref Reference, *C.I* Confidence interval, *JHS* Junior High School, *SHS* Senior High School, $p < 0.05$ was considered statistically significant

Source: Field data

practice, indicating a need for tailored interventions that consider local contexts and barriers. By engaging various stakeholders and implementing targeted strategies, the uptake of PMCS practices can be significantly improved, ultimately reducing the prevalence of genetic blood disorders in the Ahafo Region and beyond. Nonetheless, we suggest that these proposed recommendations or suggested interventions should be evaluated for impact prior to full implementation.

Strengths and limitations of the study

This study possesses several strengths and limitations. Among its strengths, the study's use of a cross-sectional design allowed for a comprehensive snapshot of the current KAP of young adults regarding PMCS, with a relatively large and diverse sample size of 460 respondents. The inclusion of both urban and rural participants enhances the generalisability of the findings. Additionally, the study's methodology, including the use of a validated structured questionnaire and the translation of survey instruments into local dialects, ensured cultural relevance and improved respondent understanding. However, limitations include the potential for self-report bias, as participants may have overreported positive attitudes or practices due to social desirability. The cross-sectional nature of the study also means it cannot establish causality between the variables studied. Furthermore, the study's focus on a single region may limit the applicability of the findings to other regions in Ghana or similar contexts. Moreover, the use of binary response options for certain key questions, which may have oversimplified participants'perspectives on PMCS. For example, questions such as"Who should be screened?","When to do PMCS?", and"If your future spouse is a carrier, will you proceed with the marriage?"had limited response choices that may not have fully captured participants' nuanced views or considerations. Additionally, questions related to timing of screening among married and unmarried participants were also structured with binary options, potentially restricting variability in responses. Future studies should consider using Likert scales or open-ended responses to allow for more detailed insights and a better understanding of participants'decision-making processes regarding PMCS. Despite these limitations, the study provides valuable insights that can inform targeted interventions to improve PMCS uptake.

Conclusion

This study examined the knowledge, attitudes, and practices (KAP) of young adults in the Ahafo Region regarding premarital screening for genetic blood disorders and identified factors associated with these outcomes. The findings indicate that while 66.7% of respondents exhibited positive attitudes toward premarital screening, only 19.8% had good knowledge, and only 14.1% engaged in positive screening practices. Key demographic factors, including age, educational level, and marital status, were significantly associated with KAP scores.

A critical finding of this study is the disconnect between attitudes and actual screening practices. Despite an overall willingness to undergo screening, a low level of knowledge and poor engagement in screening behaviours suggest that positive attitudes alone are insufficient to drive action. This gap highlights the need for improved public education initiatives to enhance knowledge and encourage proactive participation in premarital screening programs.

These findings provide valuable insights into the challenges of promoting premarital screening in the Ahafo Region and underscore the importance of addressing knowledge deficits to bridge the gap between attitudes and actual screening behaviours.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s13690-025-01611-6.

Supplementary Material 1: Table 1. Comparison of mean knowledge scores between respondents with good and poor knowledge of premarital screening for genetic blood disorders in the Ahafo Region of Ghana.

Supplementary Material 2: Table 2. Comparison of mean attitude scores between respondents with positive and negative attitudes toward premarital screening for genetic blood disorders in the Ahafo Region of Ghana.

Supplementay Material 3: Table 3. Comparison of mean practice scores between respondents with positive and negative practices regarding premarital screening for genetic blood disorders in the Ahafo Region of Ghana.

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Authors' contributions

LS and DK conceptualised the study and methodology. LS performed data curation, investigation, and formal analysis. LS and wrote the draft manuscript. FAA, PA, EAO, and PN contributed to data curation. RJT contributed to data analysis. DK and JDP reviewed the draft manuscript and made substantial revisions. All authors approved the manuscript.

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Data availability

No datasets were generated or analysed during the current study.

Declarations

Ethics approval and consent to participate

The ethical clearance was acquired from the Kintampo Health Research Centre (KHRC IEC) Institutional Ethics Committee with study file number 2023–33. Permission was also obtained from the Ahafo Regional Health Directorate and the managers of the health facilities involved in this study. Additionally, written informed consent was obtained from each respondent, and informed of his/her right to withdraw from the study at will without any consequences.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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