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Uptake of Covid-19 Vaccinations in the Aftermath of Covid-19 Pandemic among Adolescents in the Bole District of the Savanna Region

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Abstract

This study examines adolescents' knowledge, attitudes, and uptake of COVID-19 vaccinations in the wake of the pandemic in the Bole district of the Savannah Region. Data was gathered through focus groups, and key informant interviews. Thematic analysis was employed for data analysis. The findings confirmed Rosenstock Health belief theory which discussed some components that may affect the behaviour of people to accept immunization/vaccination. This revealed a moderate level of knowledge among adolescents, with gaps in understanding the broader significance of vaccination. Attitudes were mixed, with positive sentiments attributed to perceived protective benefits and concerns about the necessity of vaccination. Diverse perceptions regarding safety, efficacy, and significance of COVID-19 vaccines were identified. The study recommends targeted educational programs, community engagement, and communication strategies to enhance vaccine-related knowledge and address hesitancy among adolescents. Future research is encouraged to explore broader geographical scopes and diverse populations for a more comprehensive understanding.

Keywords: *Adolescents, COVID-19, Qualitative Study, Vaccination.*

Introduction

The SARS-CoV-2 virus is the infectious agent that causes coronavirus illness (COVID-19) [1]. Respiratory disease is experienced by those who have contracted the virus. Nonetheless, some people get severe illnesses and need medical care. The three most typical signs of COVID-19 are fatigue, dry cough, and fever [2]. Because it is a respiratory condition, an infected person may spread the virus through sneezing, speaking, coughing and poor practices of respiratory etiquettes and hand hygiene. Among the methods to stop the infection from spreading to oneself and others are wearing an appropriately fitting nose mask, washing your hands often, and applying an alcohol-based rub [3].

A major COVID-19 sickness is expected to attack the vulnerable, particularly the aged and other with medical illnesses such as diabetes, cardiovascular disease, cancer, or chronic respiratory ailments. However, the condition could also affect anybody which could become serious [4]. According to Fazel et al. (2021), With the COVID-19 pandemic spreading to several countries and being labelled as a "disease of the young," the focus shifted to preventing the disease's spread among younger people [5]. Due to their developing immune systems and limited ability to defend themselves against infectious diseases,

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adolescents were susceptible to the COVID-19 infection. Thus, in order to meet the immunization targets for public health, it is critical to assess the knowledge and attitudes regarding the uptake of COVID-19 vaccinations in this group [6].

Agyekum et al. (2021), claim that it is one of the deadliest illnesses in living memory [7]. Around the end of 2019, the first case of the novel Corona Virus (COVID-19) SARS-CoV-2 was reported in China [7]. By January 2020, the virus had quickly spread to other countries. The World Health Organization (WHO) declared the epidemic to be a pandemic on March 11, 2020 [1].

The new coronavirus disease (COVID-19) had more than 200 million cases worldwide by August 2021. Over 4 million of those included in this number tragically passed away [8]. At that point, there were approximately 4 million cases and over 100,000 deaths in the African region [8]. On the 18th of July 2022, the global view of Covid-19 stood at 569,194,391 cases and 540,403013 deaths. Africa recorded 12,423000 cases and 256000 deaths in mid July 2022 [2]. At the time of the COVID-19 pandemic, many African nations implemented lockdowns or quarantines to control the blow-out of the virus. However, these actions unintentionally resulted in negative consequences such as worsening non-COVID-19-related health outcomes, increasing mental health problems, and exacerbating economic inequality [2].

Ghana announced its first two COVID-19 cases on March 12, 2020. [9]. Ghana declared a partial lockdown on March 28, 2020, commencing on March 30, 2020, at 1:00 local time, and continuing for 14 days. One hundred and forty-one cases of COVID-19 were confirmed in Ghana when the control measures were implemented [10]. Only basic things like food, medicine, water, paying utility bills, going to the hospital, pharmacies, or banks were allowed for citizens to leave their houses [10]. To handle the COVID-19 pandemic's probable repercussions in Ghana, the government set five main goals. These included (1) limiting and stopping the virus's importation, (2) containing its spread, (3) providing proper treatment for the ill, (4) reducing the virus's negative effects on social and economic life, and (5) boosting domestic output to promote independence [10].

Due to a lack of vaccine availability and the fact that most young people were showing mild signs and symptoms, these groups of people were not prioritized. Young people, however, had infection rates that were comparable to those of other population groups, which means that they could potentially spread infection to more at-risk individuals in their homes, schools, and communities.

Meanwhile, several investigations have demonstrated that COVID-19, especially when the delta variation is present, can be a dangerous illness that even affects children and teenagers, requiring hospitalization due to severe complications [11].

Once more, early data from high-income to low-income nations indicates that children and teenagers younger than 18 may contract and spread SARS-CoV-2 illness [12]. However, information that was accessible globally showed that youth and adolescents were becoming more and more representative of the COVID-19 case load [12]. The insurgence of Covid-19 had dire consequences in all spheres of life affecting every human social and economic activity.

Evidence from a field survey showed that there was low turn-out rate of the people of Bole toward Covid-19 vaccination, and this was attributed to some fears. A report from the Bole District Health Directorate indicated that the district recorded a total 433 suspected cases out of which 93 were confirmed positive cases with 2 deaths from the start of the covid-19 pandemic in 2020 to the first quarter of 2023 in the Bole District [13].

In the Savanna region, out of the 7 districts, the total number of people vaccinated in Bole

as of February 2023 for all doses (1st dose+2nd dose+ 1st booster+ 2nd booster) was 83,810. The entire count of individuals who received a dosage was 35,246 representing (15.6%) of the total population of 120,715, the total adolescent population (persons between the ages 10-19 years) was 27,040, representing 22.4% of the total district population vaccinated. This constituted the lowest age group being vaccinated against the district Covid-19 vaccination target of 58%. According to the Bole District Health Information Officer, "Ghana Health Service has integrated Covid-19 vaccination into its routine vaccination schedule in an effort to contain the pandemic and prevent its resurgence after it was deemed to be a public health concern rather than an emergency". The results are yet to be achieved most especially among the adolescents [13].

Negative attitudes and misconceptions about vaccine safety and effectiveness can lead to reluctance to get vaccinated. Also, peer influence can influence the uptake of the vaccination among adolescents. Additionally, certain perceptions, such as beliefs in conspiracy theories or misinformation, can further hinder the acceptance and uptake of COVID-19 vaccinations among adolescents.

This study is required to fill a research gap concerning the knowledge, attitudes, and ongoing uptake of the COVID-19 immunizations in the aftermath of the pandemic specifically among adolescents in the Bole District. According to Bole District Health Directorate, the total adolescent population (persons between the ages 10-19 years) was 27,040, representing 22.4% of the total district population vaccinated [13]. While there have been studies exploring vaccine acceptance and hesitancy in general populations, there is limited research focusing specifically on adolescents. Prior studies have mostly concentrated on adult populations, which has resulted in a large knowledge vacuum on the variables influencing teenage vaccination uptake in this district. Moreover, a customized study is necessary to pinpoint the obstacles and prospects for enhancing adolescent vaccination uptake in the Bole District due to its distinct features and contextual elements. Therefore, the study's main objective was to evaluate the participants' knowledge, attitudes, and perceptions on the Uptake of COVID-19 Vaccinations among Adolescents in the Bole District. The results of this investigation may help in the development of targeted interventions, educational campaigns, and strategies to increase vaccine uptake among adolescents.

Conspiracy Theories about Covid-19 Vaccines

Since immunization was first proposed and widely accepted, there has been anxiety and suspicion over vaccinations. "Agree" is the response given by respondents to a nationally representative study of Americans when it comes to "doctors and the government still wanting to vaccinate children even though they know these vaccines cause autism and other psychological disorders." For instance, the idea that vaccines can cause autism is unsupported by empirical evidence [14].

State officials promoted conspiracy theories in some nations, such as the US, which recorded the most confirmed COVID-19 cases [15], and a disturbing one-third of US residents appeared to have believed in these beliefs, such as that the virus was intentionally created. Conspiracy theories are explanatory ideas concerning a group of people who work together covertly to achieve evil objectives [15]. Other conspiracies claimed that COVID-19 was purposefully bioengineered, a biological weapon, or a plan to control the populace [16].

Douglas, (2021), asserted that when psychological demands are not being addressed, conspiracy theories are significant, a poll from the Netherlands, Germany, and Italy indicated 92–99% of respondents resorted to various social distancing practices [17]. What then can account for the USA's comparatively

high non-adherence rate? One significant factor may be the widespread acceptance of COVID-19 conspiracy claims. For instance, some literature demonstrates evidence that a hot environment kills viruses, yet COVID-19 is spreading to some hot nations [18].

COVID-19 immunization campaign is facing a "infodemic" in Europe. Europe's reluctance to receive vaccinations is mostly due to "infodemic." Excessive information that spreads quickly, is purposefully or unintentionally deceptive, and prevents the general public from acting appropriately in times of public health emergency is referred to as a "infodemic [19].

The global public health emergency associated with the Covid-19 epidemic has passed. Over the course of more than a year, the population's immunity to infection and vaccination has grown, fatality rates have dropped, and overall strain on health services has lessened, putting an end to the pandemic. Therefore, I fervently hope that I may officially proclaim Covid-19 to be over as a worldwide health emergency. But that does not imply that Covid-19 is no longer a hazard to international health [20].

While there has been substantial progress in COVID-19 vaccine development and distribution, the uptake of vaccines among adolescents remains a critical concern. Understanding the knowledge, attitudes, and perceptions towards COVID-19 vaccinations among adolescents is crucial for designing effective vaccination campaigns tailored to this specific age group. The Bole District, located in Savanna Region of Ghana, represents an important setting for examining the uptake of COVID-19 vaccinations among adolescents due to its unique characteristics, such as the youth dominance of the population of the district.

Theoretical Framework

This study is based on an adopted theoretical framework from (Rosenstock, 1966) on health belief model [21]. The concept discussed some components that may affect the behaviour of people to accept immunization/vaccination. It explains why most people failed to utilize health services such as immunization/vaccination. It also highlights the role of certain beliefs in stimulating preventive health actions. It goes on to say that people's actions linked to their health will change based on how serious they believe the threat to their health to be. It looked at six (6) different methods to this module in its conclusion. Perceived susceptibility or vulnerability refers to an individual's subjective assessment of the likelihood of contracting an illness. A person's perception of the seriousness of getting sick or of not getting treatment for their sickness is known as perceived severity. Perceived benefits refer to an individual's assessment of the efficacy of different interventions aimed at preventing or curing sickness. Perceived barriers are people's perceptions of the difficulties in carrying with advised health actions, Cues to action: the internal or external stimulus required to start the decision-making process to embrace a recommended health action Self-efficacy is the degree to which an individual believes that he can carry out an action successfully [22].

This framework also recognised the need for a study to be carried out before any intervention is designed. This study is therefore in accordance with the framework.

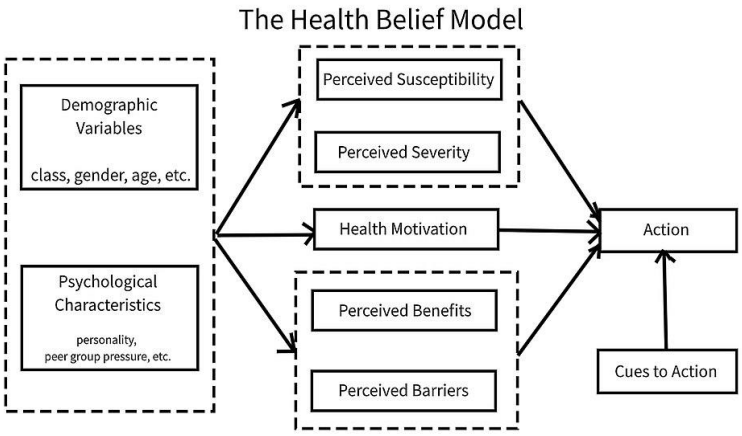

Figure 1. Health Belief Model, Rosenstock, (2015) [21]

Study Area

The study area is Bole District in the Savannah Region of Ghana. The district is situated between latitude 8'10.5 and 09' and longitude 1.50E' and 2.45 W. It is located at the extreme western part of the Savannah region of Ghana. It is also bordered to the north by the Sawla-Tuna-Kalba district, to the west by the Republic of Cote D'ivoire with the Black Volta as the boundary between the two neighbouring countries, to the east by the West Gonja district and to the south by the Kintampo and Wenchi Municipalities in the Bono and Bono East regions [22, 23].

The population of the district is 120,715 projected based on the 2020 population census of 62,719 using 3.6% National Growth Rate and 78,836 using 2.9% Growth Rate of Savannah Region. Ghana Health Service is the main institution that provides health services including CHAG facilities [22, 23].

Adolescents in the Savannah Region and the Bole district participated in the study. Among the sixteen regions of Ghana, the Savannah region occupies around 70,384 square kilometers, or 29% of the country's total land area. As of the 2020 census, 2,336,196 people are estimated to live there. It is split up into seven (7) administrative and political districts, each of which is led by a district chief executive. The districts are further divided into 45 health sub-districts, one of which being Bole district, the site of the study [22, 23].

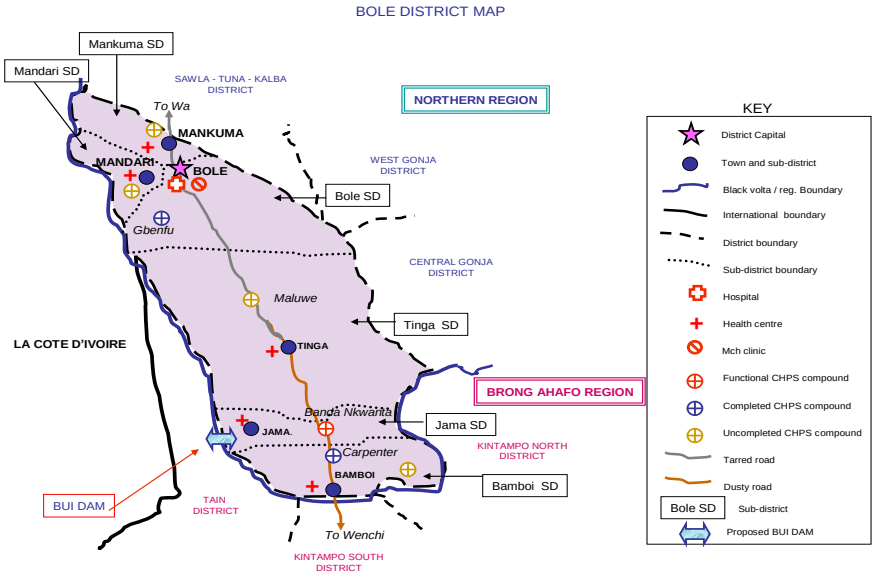

Figure 2. Map of Bole District, Bole District Assembly (2O20), Bole District, (2010) [22, 23]

Health Services Provided

Health services provided at the health institutions include preventive, promotive, curative, palliative and rehabilitation. Specific services are reproductive and child health (RCH) which embodies ANC, Skilled Delivery, PNC, Family Planning services, Expanded Program on Immunization (EPI), Growth promotion, integrated outreach services, community –based health planning and services (CHPS) as well as treatment of clinical cases, minor ailments and screening services. In otherwise preventive, promotive, curative and community base (CHPS) services are provided in the district [13, 25].

The health status of the people of Bole district is among the worst in the Region. Utilization of available health facilities and health services is very low, especially among the adolescents. There is poor health seeking behaviour and many patronize the services of quack doctors, herbalist and rather report very late to the health facilities as a last resort. Family Planning Acceptor Rate is very low 4.3%. This is as a result of socio-cultural and religious beliefs coupled with rumors that need to be addressed [13].

Study Design

A qualitative method was used. a population-based survey and is used to assess the knowledge, attitude, and uptake of Covid-19 vaccines among adolescents at a relatively faster rate.

Study Population

The study population is adolescents between the ages of 10 – 19 years and who has either taken a jab with evidence card or has never taken a jab and who leave in urban and rural communities within the Bole district.

Data Collection Tool

Focus Group Discussion (FGD) was conducted to allow in-depth exploration of different points related to the topic. Focus Group Discussion guide was prepared to guide for study. Also, field notes were taken alongside the use of a tape recorder to complement the written notes. Participants will be with the same characteristic such as socio-economic, age and sex which will create an enabling environment for them to communicate freely. They will be identified in the communities based on their own interest to be part of the discussions. Each group will consist of eight to ten participants. Their opinion will be always respected to enable them actively to contribute to the discussion without fear, and to enable to enable the researcher compare findings. The discussion will be led by a moderator and there will also be a note taker. Each discussion will last between one and one and half hours. For the sake of privacy, the study participants will be isolated from the public for discussion.

Key Informants Interview

Key informant interview was carried out by identifying two adolescent health educators in the communities where the study will be conducted, this will provide a one-on-one conversation to explore the topic in detail. It will also encourage respondents to come up with their opinion about the topic to validate with the focus group discussions. A semi structured interview guide with open-ended questions was prepared to guide the interview. The data collection continued until there was saturation of information and themes, where no new information is generated in the final interview.

Data Management and Analysis

The data collected was analysed using the thematic analysis, and the audio recordings transcribed by putting them into themes and coded. The teams were identified by bringing together the fragments of ideas and experiences from the data collected. It was translated and interpreted. The differences and similarities of the data were compared. The data collection continued until there was saturation of

information and themes, where no new theme was generated in the final interview.

Ethical Clearance

Ethical clearance was obtained from the ethics committee of the University for Development Studies. Participants were counselled and permission was sought before interviews. Confidentiality was assured about the information provided. The anonymity of the participants was guaranteed and Focus Discussion Group made it to agree to keep the discussion confidential. The purpose of the study as well as the general themes was explained to participants to understand what the discussion was about.

Results

Demographic Features of the Respondents

This section presents an overview of the demographic characteristics of the study participants, as illustrated in Table 1, reveals that in terms of age, most respondents are in the 16-18 years bracket, making up 30% of the total. This is followed by the 12-15 years group comprising of 20%, and the 19-21 years group also made of 10%. The gender distribution is evenly balanced, with an equal number of male and female respondents, each representing 50% of the total. From an educational standpoint, many individuals have completed Junior High School (40%), followed by Senior High School (30%), College/University (16%), and Other (14%). Most people live in rural areas when it comes to residential locations (76%).

Table 1. Results on the Demographic Features of the Respondents

Demographic Feature	Option	Frequency	Percentage (%)
Age	12-15 years	100	20
	16-18 years	150	30
	19-21 years	50	10
Gender	Male	250	50
	Female	251	50
Educational Level	Junior High School	200	40
	Senior High School	150	30
	College/University	80	16
	Other	71	14
Residential Location in Bole District	Urban	120	24
	Rural	381	76

Source: Field Data Analysis, (2023)

Focus Group Discussion Responses

The results from the focus group discussions with the participants were presented in Table 2. It revealed several key themes and sub-themes regarding COVID-19 vaccination.

Table 2. Themes and Sub-Theme

	Core themes	Subtheme
Theme 1	Knowledge	1. Awareness About COVID-19 Vaccines
		2. Sources of Information of COVID – 19 Vaccines
		3. Reliable Sources of Information
		4. Barriers or Challenges in Accessing Information
		5. Myths or Misconceptions

		6. Concerns or Doubts
Theme 2	Vaccination	1. Perceived Safety
		2. Efficacy in Protection
		3. Significance of Vaccines
		4. Understanding of Long-term Effects
		5. Belief in Crucial Role of Vaccines

Theme 1: Knowledge

1. **Awareness About COVID-19 Vaccines**

"I know vaccines protect against COVID-19, but specifics like types and effectiveness vary among us." Participant 1 in Group 3

"Learning in school helps, but media updates and discussions with friends add more details." Participant 2 in Group 2

"Some think vaccines cause the virus or alter DNA; clarifying such myths is crucial." Participant 3 in Group 1

2. **Sources of Information of COVID – 19 Vaccines**

"School teachings give basics, but social media and healthcare provider discussions provide real-world context." Participant 4 in Group 2

"Media is quick, but healthcare providers explain better during check-ups or special sessions." Participant 5 in Group 3

"We share information with each other; it's like a mix of school lessons and friend discussions." Participant 6 in Group 1

3. **Reliable Sources of Information**

"Healthcare providers are trustworthy; they give personalized advice, making it more reliable." Participant 3 in Group 2

"Official announcements and news are good, but sometimes they're too general; we prefer detailed discussions." Participant 9 in Group 3

"We rely on fact-checking websites; they help confirm if what we hear elsewhere is accurate." Participant 10 in Group 1

4. **Barriers or Challenges in Accessing Information**

"In rural areas, limited internet access affects getting timely updates; we rely more on community discussions." Participant 1 in Group3

"Misinformation spreads fast, and it's hard to separate fact from fiction; clearer guidance is needed." Participant 4 in Group 3

"Sometimes, healthcare information seems complicated; simplifying it would make it more accessible." Participant 2 in Group 2

5. **Myths or Misconceptions**

"People say vaccines give you COVID-19; it's confusing, and we need more accurate information." Participant 7 in Group 2

"Some think microchips are in vaccines; these ideas spread fast and create unnecessary fears." Participant 8 in Group 1

"Misconceptions about fertility issues need addressing; they affect decisions, especially among girls." Participant 9 in Group 1

6. **Concerns or Doubts**

"Side effects worry some; understanding what's normal and what's would not be reassuring." Participant 3 in Group 3 in Group 1

"Long-term effects are a mystery; more information on that would help clear many doubts." Participant 5 in Group 1

"People are unsure about vaccine safety; building trust in the process is essential." Participant 1 in Group 2

Theme 2: Vaccination

1. Perceived Safety

Participant in Focus Group 1: Observed thus *"I believe the vaccines are safe, especially after observing family members get vaccinated without any major issues."*

Another participant in Focus Group 2 asserted that: *"There's some concern about*

long-term effects, but overall, I trust the science behind the vaccines."

Participant in Focus Group 3: *"Safety is a priority, and I rely on healthcare professionals for accurate information on vaccine safety."*

2. Efficacy in Protection

Participant in Focus Group 1 intimated that: *"I've seen the vaccines work in preventing severe illness, so I'm confident in their effectiveness."*

Participant in Focus Group 2 has it that: *"I'm unsure about how long the protection lasts, but the immediate protection is reassuring."*

Participant in Focus Group 3 equally observed as: *"There's a general belief that the vaccines are effective in reducing the spread of the virus."*

3. Significance of Vaccines

Participant in Focus Group 1 asserted that: *"Vaccines are crucial for protecting vulnerable populations and achieving herd immunity."*

Participant in Focus Group 2 says that: *"I see vaccination as a way to return to normalcy and protect my loved ones."*

Participant in Focus Group 3 observes the following: *"Despite some doubts, I understand the importance of vaccines in controlling the pandemic."*

4. Understanding of Long-term Effects

Participant in Focus Group 1 says that: *"I'm curious about any potential long-term effects, but I trust ongoing research to provide answers."*

Participant in Focus Group 2 indicates that: *"There's a need for more information on the long-term effects of the vaccines to alleviate concerns."*

Participant in Focus Group 3 has it that: *"Long-term effects are a concern, but I weigh them against the immediate benefits of vaccination."*

5. Belief in Crucial Role of Vaccines

Participant in Focus Group 1 asserted that: *"I believe vaccines are essential in ending the pandemic and preventing future outbreaks."*

Participant in Focus Group 2 indicates: *"Despite some skepticism, I recognize the role vaccines play in saving lives and reducing hospitalizations."*

Participant in Focus Group 3: *"I have faith in the science behind vaccines and their ability to protect us and our communities."*

Key Informant Interview Responses

The themes emerging from the key informant interviews were presented in Table 3.

Table 3. Key Informant Interview Responses

	Themes
Theme 1	General Attitudes Towards COVID-19 Vaccination
Theme 2	Factors Influencing Attitudes Towards COVID-19 Vaccination
Theme 3	Discussion with Family or Friends About COVID-19 Vaccination
Theme 4	Specific Concerns or Fears Regarding COVID-19 Vaccination
Theme 5	Confidence in the Safety and Effectiveness of COVID-19 Vaccines
Theme 6	Barriers or Challenges in Accessing COVID-19 Vaccination

The interview responses provide insights into various themes related to attitudes towards and factors influencing COVID-19 vaccination among adolescents. These themes include general attitudes towards vaccination, factors influencing attitudes, discussions with family or friends about vaccination, specific concerns or fears regarding vaccination, confidence in vaccine safety and effectiveness, and barriers or challenges in accessing vaccination.

THEME 1. General Attitudes Towards COVID-19 Vaccination

Respondent 1: *"I've noticed a positive shift, especially among those with family members affected. They see vaccination as a protective measure."*

Respondent 2: *"Mixed feelings, some are eager for protection, while others question the need for vaccination, influenced by various factors."*

Respondent 3: *"Many adolescents are curious but cautious. They want to understand more before making a decision."*

THEME 2. Factors Influencing Attitudes Towards COVID-19 Vaccination

Respondent 4: *"Peer influence is strong, and reliable information plays a vital role. Those who trust their sources tend to be more receptive."*

Respondent 5: *"Past experiences with vaccinations shape attitudes. Also, family opinions and cultural beliefs impact their perspectives."*

Respondent 6: *"It's a mix of media influence and community discussions. Adolescents often mirror the opinions they encounter."*

THEME 3. Discussion with Family or Friends About COVID-19 Vaccination

Respondent 1: *"Families play a crucial role. Supportive discussions help ease concerns, but differences in opinions are common."*

Respondent 2: *"Adolescents often consult family members. Some encounter resistance, while others find encouragement."*

Respondent 3: *"Discussions vary. Some families are well-informed and supportive, while others have reservations."*

THEME 4. Specific Concerns or Fears Regarding COVID-19 Vaccination

Respondent 4: *"Speed of development is a concern. Addressing these fears requires targeted education campaigns."*

Respondent 5: *"Fear of side effects is prevalent. Clear communication about vaccine safety is essential."*

Respondent 6: *"Misinformation causes fear. Correcting false beliefs is an ongoing challenge."*

THEME 5. Confidence in the Safety and Effectiveness of COVID-19 Vaccines

Respondent 1: *"Trust in science is a key factor. Those who follow reputable sources are more confident."*

Respondent 2: *"Doubts persist, especially among those exposed to misinformation. Continuous education is needed."*

Respondent 3: *"Confidence levels vary. Effective communication on vaccine safety is critical."*

THEME 6. Barriers or Challenges in Accessing COVID-19 Vaccination

Respondent 4: *"Transportation remains a hurdle, especially in remote areas. Making vaccination centres accessible is crucial."*

Respondent 5: *"Awareness about vaccination centres is lacking. Improving outreach can enhance accessibility."*

Respondent 6: *"Logistical challenges affect access. Overcoming these hurdles requires community-specific strategies."*

Discussion

The study found that adolescents had a modest level of trust in their knowledge about the COVID-19 vaccine. This is consistent with the discoveries made by Abbas et al. (2021), who uncovered a diverse range of beliefs and misconceptions regarding COVID-19 vaccines within a population in Sindh, Pakistan. Nonetheless, the diverse degrees of trust among the participants in the study emphasise the intricate nature emphasised by Acheampong et al. (2021) in their analysis of vaccination hesitancy in Sub-Saharan Africa, highlighting the necessity for focused educational programmes to tackle uncertainty.

The Bole District survey revealed a notable level of doubt in determining the proper age group for vaccination, as participants expressed uncertainty regarding the correct age range. The uncertainty observed in this study aligns with the results of Efendi et al., (2022), who discovered sociodemographic variables that

impact the level of COVID-19 vaccine compliance among teenagers in Indonesia. Nevertheless, the current study's moderate degree of understanding differs from Lv et al., (2021) comprehensive analysis, which highlighted protection, and effectiveness of COVID-19 vaccinations in teenagers, indicating more substantial grasp in that area.

The participants' dependence on healthcare experts or reliable sources for information. The results of Cai et al., (2021) study align with this, as they underscored the favourable sentiments Chinese teenagers have about COVID-19 vaccines, with a particular emphasis on the influence of healthcare providers in creating these beliefs. Nevertheless, the participants' dependence on healthcare experts contradicts the results of Rehati et al., (2022) in Chinese urban areas, where vaccine reluctance was detected among teenagers even before the vaccines were accessible. The variation in vaccine distribution and public opinion may be attributed to contextual disparities.

The finding displayed a range of awareness levels concerning the advantages of COVID-19 vaccinations, with participants considering themselves partially to entirely misinformed. This discovery aligns with Wang. et al., (2022) study on vaccine hesitation among adolescents in sub-Saharan Africa, indicating that insufficient understanding contributes to hesitancy. However, the study's moderate degree of comprehension is different from Adjaottor et al., (2022) study, which predicted COVID-19 stress and vaccination acceptability among adolescents in Ghana. This highlights the complex nature of attitudes towards vaccination.

The Bole District study indicated a significant participant not experiencing any side effects, indicating a moderate level of overall experience with side effects. This is consistent with Lv et al., (2021), which highlighted the safety of COVID-19 vaccinations in children and adolescents. Nevertheless, the current study's moderate degree of expertise differs from the results of Rehati et al., (2022), who discovered vaccine hesitation among Chinese teenagers prior to the availability of vaccines, suggesting diverse attitudes and experiences.

The focus group conversations yielded qualitative insights that offered nuanced perspectives on concerns and uncertainty. The participants' reference to misunderstandings related to vaccination-induced virus or DNA modification aligns with the existing body of work on vaccine misinformation [18]. In addition, barriers to accessing information, such as limited internet connectivity and the spread of misinformation, correspond with the issues raised by Abbas et al., (2021), underscoring the importance of tailored communication techniques in various settings.

The findings of the Bole District study regarding the awareness of COVID-19 vaccines among adolescents are consistent with certain features of previous research. These findings highlight the significance of healthcare providers, the varying degrees of confidence, and the widespread presence of misinformation. Nevertheless, differences in levels of understanding, lack of certainty regarding age-specific details, and encounters with adverse reactions introduce subtle aspects that are not completely reflected in the existing literature. This highlights the necessity for interventions and communication strategies that are specific to the context and tailored to the distinct dynamics of the study population.

This discovery aligns with the wider body of research on vaccination hesitancy, as demonstrated by Acheampong et al., (2021) and Kabakama et al., (2022), who investigated the understanding and opinions regarding COVID-19 immunisations among adult individuals in Ghana. The diverse emotional reactions observed among participants underscore the necessity of customised communication tactics to effectively address distinct concerns and cultivate favourable attitudes.

The finding highlights the acknowledgement of vaccination's role in promoting public health. This discovery is consistent with Alhassan et al., (2021) study in Ghana, which examined the reluctance of adults to receive vaccines. The study highlights the significance of comprehending public attitudes to shape effective vaccination campaigns [8]. The discovery underscores the importance of comprehending the social processes that shape vaccination attitudes, as elucidated by Fan et al., (2021) among university students in mainland China. Key Informant 1's reference to the influence of family dynamics is consistent with existing research on the effects of family conversations on vaccination choices.

The importance of implementing focused educational initiatives to improve trust in scientific knowledge, as emphasised by Key Informant 1. This is consistent with research conducted by Uscinski et al., (2020) van Prooijen & Douglas, (2018), which examined the elements that influence the acceptance of conspiracy theories. These studies highlight the significance of countering disinformation to foster trust in vaccination efforts.

The range of viewpoints, as evidenced by the average rating of 2.95, underscore the necessity for focused communication tactics, specifically targeting apprehensions over the rapidity of vaccine creation, as emphasised by Key Informant 4. This is consistent with Wolff, (2021) research, which utilised the Theory of Planned Behaviour to investigate individuals' intentions to receive the COVID-19 vaccine. The study highlights the need of addressing perceived risks in vaccination efforts.

Key informants had specific worries and fears about COVID-19 vaccination, including apprehension about potential side effects and the impact of disinformation. These qualitative observations are consistent with the existing body of research on the influence of conspiracy ideas [15] and the necessity of effective communication to address concerns connected to vaccines Greenhawt et al., (2021).

The study's findings regarding adolescents' views towards the COVID-19 vaccination programme in Bole District offer a comprehensive insight into the complex aspects that influence perceptions and acceptance. Combining numerical findings with qualitative observations improves the level of understanding, highlighting the significance of customised communication tactics to tackle various issues and promote favourable attitudes towards vaccination.

The intricacies pertaining to safety perceptions align with the findings of Adane et al., (2022) underscoring the significance of comprehending and resolving issues among healthcare professionals in Ethiopia. When evaluating the efficacy of vaccines in providing protection, it was found that participants perceived them as highly successful, and some considered them to be moderately effective, and few claimed that they were not beneficial at all. These are aligned with studies conducted by Bagateli et al., (2021) in Brazil, emphasising the importance of using focused communication techniques to tackle vaccine reluctance among parents.

The motivations for vaccination were found to be varied, with some individuals seeking to safeguard their own health, the health of others and desiring a restoration of normalcy in their lives. The findings highlight the importance of using customised communication strategies, as emphasised in the research on vaccination hesitancy in Ghana [8].

The study's findings shed light on the complex web of views and attitudes among adolescents in Bole District surrounding COVID-19 immunisations. The examination of pertinent literature emphasises the crucial requirement for tailored communication strategies and focused public health campaigns to tackle the complex factors influencing vaccination acceptance and hesitancy. This study provides useful insights into the larger comprehension of public views regarding COVID-19 vaccines, thus enhancing the

existing research on vaccine hesitancy and its determining factors.

Conclusions

The study revealed a moderate level of COVID-19 vaccine-related knowledge among adolescents in Bole District. While a significant portion demonstrated awareness, a noteworthy proportion exhibited gaps in understanding. This suggests the need for targeted educational interventions to enhance knowledge levels, ensuring a more informed adolescent population regarding COVID-19 vaccines.

Adolescents generally exhibited positive attitudes towards the COVID-19 vaccination campaign. A substantial percentage expressed willingness to participate, reflecting a favourable disposition towards vaccination. However, the presence of vaccine hesitancy signals the importance of addressing specific concerns. Tailored communication strategies and community engagement initiatives may prove instrumental in fostering more positive attitudes and mitigating hesitancy.

The study found diverse perceptions among adolescents about the safety, efficacy, and significance of COVID-19 vaccines. While a significant proportion perceived vaccines as safe and effective, a considerable number expressed reservations. These findings underscore the complex nature of vaccine-related perceptions, emphasizing the necessity for nuanced public health messaging that addresses precise concerns and builds trust.

A positive correlation between COVID-19 vaccine-related knowledge and vaccine uptake was observed among adolescents. This underlines the pivotal position of knowledge in persuading vaccination behaviour. Strengthening awareness through targeted educational initiatives may contribute to increased vaccine acceptance and uptake among adolescents.

The study identified a moderate positive relationship between adolescents' perceptions of COVID-19 vaccines and their vaccination behaviour. While positive perceptions were associated with higher vaccination rates, addressing concerns expressed by those with more negative perceptions becomes crucial. Tailoring interventions to address specific perceptions can contribute to a more favourable vaccination landscape.

Recommendations

1. The Ministry of Health as a policy making institution should develop and implement a comprehensive and targeted educational program aimed at enhancing COVID-19 vaccine-related knowledge among adolescents. This can be achieved through collaboration with educational institutions, community leaders, and youth organizations, ensuring the dissemination of accurate and accessible information to address existing knowledge gaps.
2. Ghana Health Service, responsible for policy implementation, should focus on community engagement and communication strategies tailored to address vaccine hesitancy especially adolescents as a target group. This involves actively involving community leaders, Opinion leaders and local health practitioners in disseminating information, fostering a positive attitude towards vaccination, and dispelling myths and misconceptions. The implementation of mobile vaccination clinics in schools and communities can also facilitate and increased access to vaccines.

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Conflicts of Interest

The authors declare no competing/conflicts of interests.

Informed Consent

Written consent was sought after participants were counselled and the questionnaires explained to the best understanding of the participants before questionnaire administration.

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