

A Review of Determinants of Low Measles Immunization and Feasible Interventions to Increase Uptake among Children Aged 9-59 months in the Lawra District, Ghana

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Received date: August 14, 2018; Accepted date: August 27, 2018; Published date: September 03, 2018

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Abstract

Vaccine preventable diseases contribute to about 20% of all under-five deaths globally. Annually, about 10% of un-immunized children die of measles globally. Developing countries continue to experience frequent Measles outbreaks despite numerous preventive measures. Measles is one of the vaccine preventable diseases targeted by the World Health Organization for elimination by 2020. Measles remains the top killer among children in Sub-Saharan Africa despite global progress to eliminate the disease through vaccination. Even though there is a vaccine against this disease, most countries still report low measles immunization coverages. The main aim of this review is to analyse the determinants of low measles uptake in Lawra district and recommend appropriate measures to solve this problem. An in-depth review was conducted using literature, both peer-reviewed and grey literature from 2000. The literature was retrieved from databases (PubMed, Global health, Popline) and also through the Google scholar search engine. A conceptual framework was adapted to guide the analysis of the factors affecting measles immunization coverage in Lawra district. Inadequate data from the district for comparison was a major limitation and thus further research is recommended. Out of the ninety five studies (95) that met the inclusion criteria, 85 (89%) were peer reviewed. The main factors influencing low measles immunization coverage in Lawra include the quality of immunization services, attitude of health workers, inaccessibility to services and the social class of the caregivers. Feasible intervention strategies recommended include mass media, home visits, effective supervision and partnership between the health system and the communities.

Keywords: Measles; Immunization; Ghana; Developing countries

List of Abbreviations: ANC: Antenatal Care; CBSS: Community Base Surveillance Volunteers; CDC: Centres for Disease Control; CHPS: Community based Health Planning and Services; EPI: Expanded Program for Immunization; GDHS: Ghana Demography Health Survey; GCGP: Ghana Country Gender Profile; GHS: Ghana Health Service; LDHA: Lawra District Health Administration; LMICs: Low and Middle Income Countries; MOH: Ministry of Health; MDG: Millennium Development Goal; MVC: Measles Vaccine Coverage; SDG: Sustainable Development Goals; TBA: Traditional Birth Attendance; UNICEF: United Nation Children Fund; WHO: World Health Organization.

Introduction

Immunization is very effective in reducing infant morbidity and mortality [1,2]. Vaccination against Measles has contributed to a tremendous reduction in child's death globally [3]. Nevertheless, Vaccine preventable diseases still account for about 20% of all under-five deaths worldwide [4,5].

According to the World Health Organization (WHO), the Measles vaccine since its introduction has been very effective in reducing the incidence of Measles, contributing to about 74% reduction in Measles related mortalities [3]. Nevertheless, even though there was a significant reduction in the global measles mortality, the target of 90% reduction set by the World Health Assembly in 2005 was not achieved [6,7]. This perhaps was as a result of the fact that most countries performed poorly in measles vaccination, both routine and Supplemental Immunization Activities (SIAs) [6,8,9].

In developing countries, vaccine preventable diseases alone account for more than a million infant deaths [10], with the highest percentage from Sub-Saharan Africa (SSA). The high mortality rate due to the low measles vaccine uptake, affected the contribution of measles mortality reduction towards the overall achievement of Millennium Development Goal four (MDG4) [11]. This is because routine measles immunization coverage is considered as an important indicator of progress for measuring the achievement of MDG4 [12].

Brief Description of the Problem

Despite the numerous interventions to increase measles immunization uptake particularly in developing countries, the coverage is still unacceptably low in many parts of the world [13]. The

resurgence of measles is due to weak vaccination systems in Africa which is a challenge to achieving the global measles elimination goal in 2020 [14]. Records show that there is a persistent decline in measles immunization coverage in some districts in Ghana and the Lawra district is not an exception [15], resulting in occurrence of sporadic cases across the country.

This persistent decline in the immunization coverage could lead to more devastating outbreaks in the future because of the accumulation of susceptible individuals. Figures 1 and 2 show the national and district measles immunization coverage respectively.

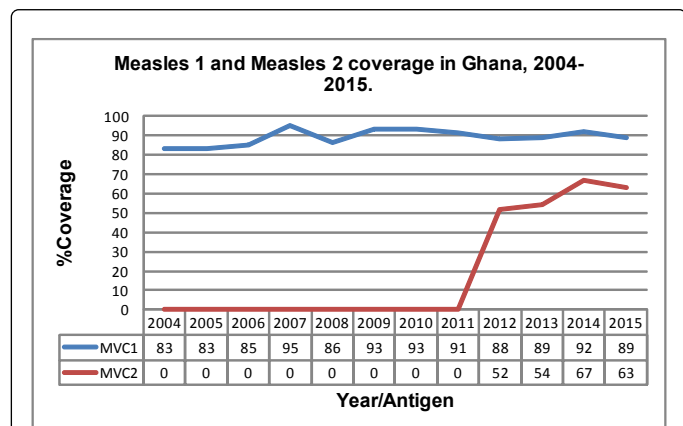


Figure 1: National Measles immunization coverage [15].

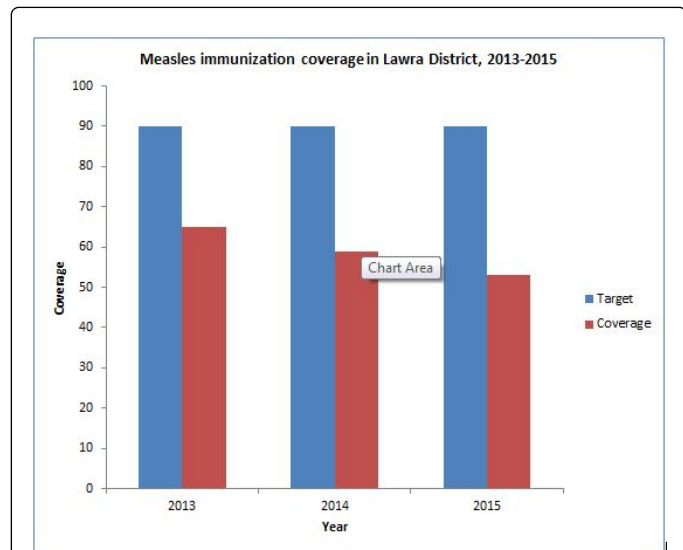


Figure 2: Measles immunization coverage in Lawra [16].

Lawra district is one of the districts located in the Upper West region of Ghana. Since 2013, the district has not achieved the 90% coverage target for routine childhood vaccination for measles [16].

Despite all efforts to increase uptake, the district has consistently reported abysmally low service indicators including measles immunization coverage. According to the data from the district's health directorate and MoH report, Lawra district is the least performing district as far as health services are concerned despite all

efforts to increase uptake [16]. The coverage in the district in 2013, 2014 and 2015 were 65%, 59% and 53% respectively even though there is adequate supply of vaccines and vaccination is free [16] (Figure 2). This is far less than the 90% target set by WHO to maintain maximum herd immunity to interrupt the measles virus transmission.

However nothing has been done in the district to find out the causes of this low performance. There is also no published literature indicating the reasons for the low coverage in the district. This puts the district at high risk of measles outbreak in addition to the already existing sporadic cases in the district.

The National Measles vaccine coverage (MVC) for both the first and second doses is however directly affected (Figure 1). If this continues, the country cannot meet the goal of measles elimination in 2020 [17]. It is indeed a fact that "the coverage of routine vaccinations in low- and middle-income countries may be lower than that previously reported and therefore very important to maintain and increase current vaccination levels" [18].

The aim of this review is to investigate the factors affecting measles immunization uptake in Lawra district in Ghana in order to recommend appropriate strategies to increase the coverage.

Methodology

Conceptual framework

A conceptual framework (Figure 3) was adapted for the analysis of the determinants of low immunization uptake in the district [19,20]. It was however modified based on the findings of the literature review as Ghana has a strong policy on immunization. The relevant literature for the study was identified and appraised from databases.

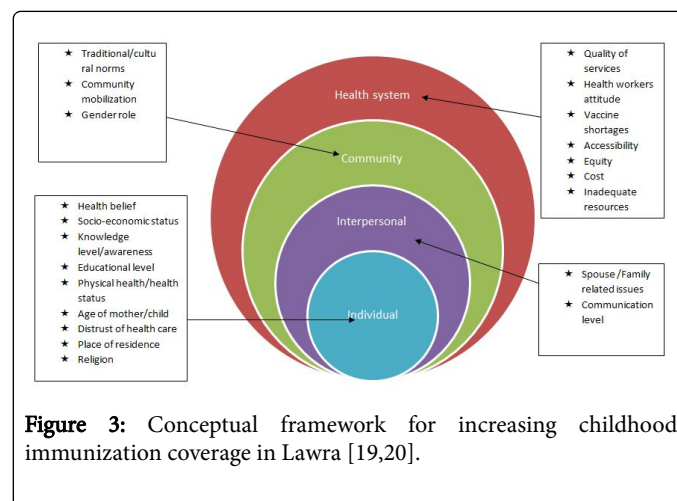


Figure 3: Conceptual framework for increasing childhood immunization coverage in Lawra [19,20].

Four (4) main components of the framework were discussed in relation to the factors influencing measles immunization uptake in Lawra identified from the literature. These are the health system, community, interpersonal and the individual characteristics (Figure 4).

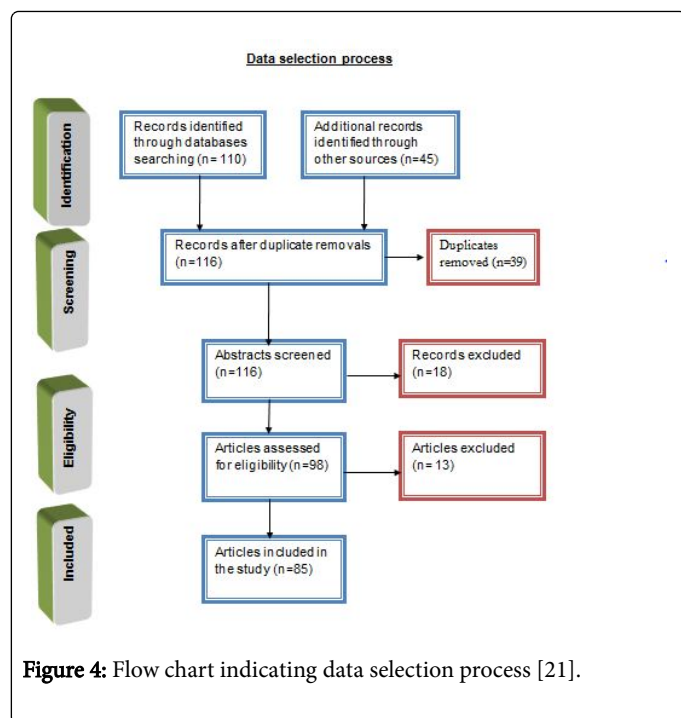


Figure 4: Flow chart indicating data selection process [21].

Health system factors

Quality of services, health workers attitude, vaccine shortages, accessibility, cost, equity and inadequate resources [22-24].

Community related factors

Traditional/cultural norms, community mobilization and gender role [25-27].

Interpersonal factors

Spouse/family related issues and communication level [27,28].

Individual factors

Health belief, socio-economic status, knowledge level/awareness, educational level, physical health/health status, age of mother/child, distrust of health services, place of residence and religion [29-31].

Immunization coverage can only be improved if the identified problems are tackled by levels since the factors are organizationally related to all these levels, from the recipient to the health care delivery system [20,32-34]. This implies that the review for the intervention strategies needs to consider these different levels as separate entities.

Sources of data

PubMed, Global health and Popline databases were used to retrieve the required literature for the study. The websites of WHO, CDC and UNICEF were also searched for other publications. Search engines and snowballing were also used to access wide range of information as well as relevant books in the University of Leeds library.

Keywords/search strategy: The search strategy was conducted using the keywords shown in Table 1. Truncations (*) were used in order to widen the search. Measles, vaccin*, immuni*, innoculat*, coverage, uptake, Ghana, developing countr*, low and middle income countr*, Africa, strateg*, factor*, affect*, influenc*, increase, improve, child*, infant*, West Africa and Sub-Saharan Africa. The search was then refined to get the final results using the 'OR' and 'AND' Boolean operators to combine these key words.

The abstracts of the articles were first read to determine if they contain important information before reading the full article. All the relevant articles were saved in an endnote bibliography file for references. A personal email account alert system was also set up in the Global health database (Ovid) and Google scholar to get updated information.

Other databases searched: Popline (15) and Cochrane (9). Search results from the other sources are as follows; Google scholar search engine (7 results), WHO website (18 results), UNICEF website (14 results) and specific online journals (8 results). Five (5) articles were also considered from snowballing.

Inclusion and exclusion criteria

Only peer reviewed articles, full text articles and current literature published from 2000 on low immunization uptake in developing countries were used. The abstracts were first read for relevancy before retrieving the full text article. Only literature published in English was used due to language barrier.

Number	Keywords	Database	
		PubMed	Global health
		Results	
1	Measles*	25391	9673
2	Child* OR Infant*	2633972	302178
3	Inoculat*OR immuni* OR Vaccin*	1125	974
4	Factor*	732	1276
		Results	

5	Ghana OR Africa OR developing countr* OR low and middle income countr* OR West Africa OR sub-Saharan Africa	432	378
6	Coverage OR uptake	345	211
7	Strateg*	987	466
8	Increase*OR influenc* OR improve*	692	455
9	1 AND 2 AND 3 AND 4 AND 5 AND 6 AND 7 AND 8	39	77

Table 1: Search strategy.

Analysis of the Factors Contributing to the Low Immunization Uptake in Lawra District

Health system

Quality of services: Immunization uptake is influenced by the quality of the services as perceived by parents [22]. Most institutions in developing countries do not provide quality health services [35]. In Ghana, the majority of parents do not send their children for immunization due to poor health service delivery [23]. There are inadequate logistics and health staff to render quality immunization services to the populace [36]. The necessary vaccines for immunization are sometimes not available leading to incomplete vaccinations [37]. This could probably be due to inadequate vaccine estimation by health staff [36].

Adverse effects caused by health workers due to poor immunizations practices could equally prevent mothers from sending the children for the subsequent doses of vaccines [38]. A recent study revealed that mothers easily forget of the immunization dates simply because either the service providers fail to remind them or they give them wrong information [39].

Attitude of health workers

Childhood immunization uptake is greatly affected by the service provider's attitude and behaviour [13]. Majority of the mothers fail to send their children for immunization simply because of the bad attitude of the service providers [40]. Also, long waiting time and undue delays by service providers affect immunization turn up as this prevents mothers from going for the subsequent immunizations [39].

In Ghana, some community health workers are not punctual for immunization services in the communities. This makes mothers to return home after waiting for a long time since most of them are farmers. Studies show that health workers sometimes arrange and cancel immunization dates without informing parents thus resulting in mistrust of the system [39,41].

It has also been noted that the high cost of services levelled on the mothers by service providers affect immunization uptake [31]. In Ghana, most care-givers do not patronize immunization services as a result of this behaviour [42]. This could be attributed to the fact that most people in the deprived areas are not registered with the National Health Insurance Scheme (NHIS) and are therefore unable to afford basic health services [43].

Even though childhood immunization is free in Ghana, health workers usually sell their own improvises and other products alongside immunization services and make it compulsory for mothers to buy.

This could also be an obstacle that prevents mothers from sending the children for subsequent immunization services [31].

Accessibility to services

The distance the mothers travel to access services is crucial in determining the service uptake [40]. In a study conducted in South-western Ethiopia, it was established that the proximity to health facilities is strongly associated with immunization uptake [41]. In Ghana, accessibility is a major barrier to health service delivery. There is poor immunization uptake due to bad road networks and the distance mothers travel to access services [42]. Children in rural areas lack equitable access to healthcare. They are more deprived of Measles immunization than those in urban areas due to inaccessible roads [44]. Only 45% of the total population in the rural areas in Ghana has access to health service delivery [36].

Despite the fact that Ghana started the Community-based Health Planning and Services (CHPS) program in order to extend health services to the deprived communities in the country [45], there are still a lot of hard to reach communities in the country. This compels mothers to travel longer distances by foot to immunize their children and could probably be one of the reasons why the immunization coverage is low in Lawra.

Community Related Factors

Traditional norms

There are cultural norms and taboos that forbid childhood immunization in some communities [22,38]. Many researchers indicated that the ethnicity of the mother is a key determinant of full childhood immunization [25,26,44]. Ghana has a lot of ethnic groups and the immunization coverage varies marginally among these groups [45]. However most of these norms are fading due to globalization and thus have little impact on immunization uptake in the country [46].

Community mobilization

Community mobilization also plays an important role in increasing and sustaining health service utilization in the communities [47]. Almost all the communities in Ghana have community health volunteers who facilitate in organising health activities in the communities [48]. Some of them are however inactive because of inadequate motivation [49]. This poses a challenge to effective community mobilization in some areas in the country including Lawra district [49].

Gender roles

Gender equality empowers women to take adequate care of the health of their children [28]. Women decision making role within the family is a key determinant of childhood vaccination uptake [41]. Therefore the inability of women to make decisions in the family adversely affects immunization status of their children [25]. Similarly, the role of women has been identified as crucial in the health and well-being of the children [27]. Nevertheless, majority of women in Ghana are powerless as far decision making is concerned [50]. In some developing countries, priority is given to boys and thus are more likely to be immunized than the girls [29,51]. However, there is evidence that no such relationship exist between gender of the child and immunization status in Ethiopia [52].

Interpersonal factors

The marital status of a woman and the number of children she has influence immunization service attendance [22]. Household decision making and the husband's attitude towards wife affect the child's immunization status [28]. Societal approval of immunization also influences uptake as most people patronize health services based on what the society says [27,50].

Individual factors

Health beliefs: Immunization uptake can be affected by the health beliefs of the parents or caregivers [13]. For instance in the year 2003, a section of people in Nigeria refused the national Poliomyelitis vaccination exercise because they hold the view that vaccination causes infertility and HIV/AIDS in children [22,30]. Most people also think that vaccines are unsafe and are also not effective in protecting their children [53]. It is also imperative to note that the religious affiliation of caregivers can impact the child's immunization status both positively and negatively [29,30].

Socio-economic status and education: In Ghana, the socio-economic status and level of education have high impact on health services utilization [54]. About 65% of the population in Ghana lives in the rural areas, out of which greater proportion are illiterates [45]. These people are less likely to immunize their children than the educated parents [24,54]. Illiteracy rate is high in Ghana especially among the women [45]. Research shows that the educational status of the mother is a strong element of childhood vaccination uptake [55].

This could possibly be one the reasons for the variation in vaccination uptake between the educated and uneducated mothers. Even though children of high social class stand higher chances of being vaccinated [56], a study in rural India found no difference between socioeconomic status and high immunization coverage due to their well-organized community health system [57].

Another school of thought revealed that children from older mothers are more likely to be immunized than those from younger mothers [58]. Teenage pregnancy is high in Ghana [59]. Most of these teenagers are not married so they probably feel ashamed to send their children for immunization.

Knowledge/level of awareness: High measles immunization uptake is strongly associated with the level of awareness and knowledge of parents [31]. Inadequate information on immunization can lead to decreased uptake [52]. Limited parental knowledge on immunization is one of the main reasons for under-vaccination in most developing

countries [13]. A study in Uganda showed that most mothers were ignorant of the need to immunize their children [60].

When mothers attend immunization services, they are well informed by the health workers about the importance of immunization and the schedule for their children [61]. This could be the reason why the findings from several researchers [51,62,63] revealed that full childhood immunization uptake is high among mothers with adequate knowledge on immunization.

It was also noted that women who patronize antenatal services and deliver at the facility have higher chances of immunizing their children than women who do not [41]. This could probably be due to the information women receive during the antenatal services about the importance of immunization [64]. Even though there is high level of awareness about child vaccination in Ghana, most mothers have limited knowledge on the benefits of immunization [65].

Health status and place of residence/birth: A study revealed that sick children and those with birth defects are not taken for vaccination due to stigma [66]. Similarly, it has been observed that the place where the child is born is significantly associated with the immunization uptake [27]. Children who live in urban areas stand higher chances of being vaccinated compared to those in deprived or rural areas [44]. This could be due to fact that children living in rural communities have inadequate access to immunizations [67]. A study in Ghana indicated a high proportion of fully immunized children in urban areas than in the rural areas [23]. This could be due to problem with accessibility as explained earlier. This is however different in rural Nigeria as high immunization coverage was discovered among rural children than the urban children as a result of effective community mobilization [47].

Also, children born in the health facility are more likely to have full immunization than those born at home [68]. There is however high Antenatal Care Attendance (ANC) and low deliveries in health facilities in Ghana [21]. Less than 50% of births are recorded in health facilities and could possibly account for the low immunization uptake [43].

Analysis of interventions strategies

The criteria used for the analysis of the interventions were based on the technical effectiveness, organizational, cultural, gender and financial feasibilities [69]. These interventions were used in countries with similar text to increase childhood immunization coverage.

Mass media education

Mass media campaign has greater potential to reach large proportion of people within a short time [70]. Studies show that mass media campaigns have contributed immensely to the control of most diseases through immunization [71,72]. Its effectiveness however depends on the target population and whether the channel and the language through which the message is passed can reach the target audience [73].

Mass media education is necessary because most parents are still ignorant about the need for immunizing their children. It will help to address their misconceptions and cultural beliefs on immunization [70].

In Pakistan, an evidence-based study involving 536 participants in the intervention group and 422 in the control group observed a significant increase in immunization coverage among those who

received education on immunization than their counterparts in the other arm, the odds of Measles uptake doubled as a result of the knowledge gained on the importance of immunization from the campaign [74]. Similarly, in Philippines, measles immunization coverage levels increased from 54% to 65% as a result of mass campaign [75].

This is however different in Zara in Nigeria where interpersonal communication was rather found to be more effective in increasing immunization uptake than mass media due to lack of trust of information from mass media such as the television and radio [76]. Even though mass media education is effective in raising awareness about immunization, it can have little effect on the deprived communities due to high illiteracy rate and inadequate access to radio, television, phones and internet services among these people [77].

In developing countries, the local health workers, volunteers, Traditional Birth Attendance (TBAs), community drama groups, traditional and religious leaders are usually the main sources of information due to inadequate access to social media [78].

It is organizationally feasible as these communication channels exist in Ghana. There is a Frequency Modulation (FM) station in Lawra district which majority of the people patronize. Immunization messages will be broadcast both in English in the local languages. The inadequate number of health education officers in Ghana and for that matter, Lawra, will however pose a challenge to the timely development of campaign messages [36]. Nevertheless, the community health promotion officers being recruited by the ministry is helpful in this regard.

Financially, it can be expensive to conduct depending on the level and the channel used [77]. Since greater percentage of the population in Lawra lives in the rural areas and are the most deprived, it will be cost effective to rely on the local health workers, volunteers, community drama groups, traditional and religious leaders and the TBAs to reach out to them with the necessary tailor-made messages [70].

Health system and community partnership

Community partnership, which is necessary to ensure active community participation, is the act of involving the community members in making decision about their health and welfare [75]. Community participation enhances immunization coverage and many children will therefore not be immunized if the communities are not involved in the organization of the immunization activities [79].

There is evidence that using community networks to promote immunization builds trust and acceptance for the vaccines [38,52]. In evaluating the drivers of routine immunization performance in Ghana, Cameroon and Ethiopia, it was observed that in all the districts where coverage increased, there was close collaboration between the health sector and the community groups to create awareness on the importance of immunization [48]. The community volunteers mobilize the various communities for immunizations in these districts.

Zimbabwe's success in sustaining high immunization coverage is due to the fact that community volunteers were tasked to educate and distribute educational materials on immunization through the media and public gatherings [80]. Community partnership can however lead to over reliance and dependence of the community on the health system if not properly handled [75].

In Ghana, the existence of the Community based Health Planning and Services (CHPS) and the community volunteers in every community make this strategy organizationally feasible. The number of health workers and volunteers is however insufficient in the district to meet the service demands [36].

Community partnership is a cost effective intervention strategy which all Low and Middle Income Countries (LMICs) have to encourage in improving their health services indicators [52]. Little funds will however be involved for community mobilization activities and provision of incentives.

In-service training and supervision of health personnel

In-service training and supervision undoubtedly enhances the quality of service delivery by health workers [48]. Studies have indicated that in-service training of health workers have improved their skills and performance [81,82], resulting to a remarked increase in immunization coverage.

In Indonesia, there was a significant increase in immunization coverage by 39% among trained and supervised health workers than the non-trained ones [83]. The study however did not consider the confounding variables and how this could possibly affect the outcome. It was also realised that Measles immunization coverage increased from 20% to 81% in the Karnataka state in India as a result of regular training and supervision of health workers [72]. Ghana has similar characteristics to these countries and this appears to indicate that adopting this strategy may yield similar results.

Other researchers however think that supportive supervision is only effective in synergy since other conditions like the staff attitude and the necessary facilities have to be present before its impact can be realized [48,57]. None of these studies however talked about how frequent in-service training and supervision should be conducted.

In terms of organizational feasibility, Ghana has a decentralized health system that supports this strategy [36]. In-service trainings and supportive supervisions are part of the activities of the Ministry of Health at all levels in the country just that they are not regularly conducted as cited before. Even though it can sometimes be expensive to organize, it is a cost effective intervention [81].

In Ghana, funds for training and supervision activities are part of the Ministry of Health (MoH) budget [36]. This is however not regular because the release of funds for activities sometimes delay. Alternatively, there are NGOs and other partners that support immunization activities where funds can be sourced to strengthen in-service training and supervision as practiced in other developing countries.

Follow-up/home visits

Home visits by health workers to trace mothers who default from immunization services have proven to be effective in increasing immunization coverage [38]. In Ethiopia, community members felt recognized and honoured about the fact that the health workers are also concerned about their welfare by paying them a visit [84]. Home visits however require a lot of human and material resources to implement and sustain [38].

In a Randomized Controlled Trials (RCT) involving 629 parents in Saskatchewan, home visits contributed to a rise in Measles immunization coverage from 67% to 74% in the intervention arm than

the controlled arm where coverage increased from 67% to 68%. This was however different in Angola as a cluster survey involving 900 respondents showed no significant improvement between home visits and immunization coverage even though there was a positive association [73]. This probably could be attributed to the short duration of the study.

In Ghana, home visits are part of the routine health services even though it needs to be strengthened [36].

Workers are not paid separately for conducting home visits in Ghana. However, the community volunteers are given incentives periodically by the MoH for their contributions to service delivery. It is therefore financially feasible in terms of implementation.

This strategy is socio-culturally and gender sensitive. In some communities in Ghana, especially the Muslim communities, men are not allowed to talk to married women unless otherwise they are related [50]. So only the female health workers or volunteers are religiously and culturally allowed to talk to these women.

Conclusion

Despite all the efforts to eliminate measles globally through improved immunization coverage, low measles immunization coverage remains a problem in Lawra district. This is due to inadequate access to immunization services, health beliefs and low awareness of the benefits of childhood immunization.

From the discussions, effective supervision, home visits and social mobilization are crucial in complimenting already existing strategies to increase the coverage. Engaging the communities and stakeholders in the district strengthens multi-sectoral collaboration and partnership which is vital in addressing health services delivery related challenges.

Inadequate data however from the district and Ghana on the topic made the researcher to rely on some grey literature in the country, other vaccination programs and articles from developing countries since they have similar characteristics. Non-English literature which could contain vital information was not considered.

Recommendation

Multiple delivery strategies are recommended by WHO in increasing immunization coverages as one strategy is insufficient to achieve this minimum target. All the interventions reviewed proved to be successful in enhancing immunization uptake. However, the following interventions are much likely to be effective in the Ghana context following implementations based on the technical effectiveness, organizational, gender and financial feasibility. Regular home visits are important in tracing defaulters of immunization services. Secondly, the communities should be involved in the planning and organization of immunization services. Mass media education on the benefits of immunization is also necessary to create awareness and address the false beliefs on immunization. Engaging the community leaders, opinion leaders and the various social groups and channels in the communities are much easy ways of passing information to the people. Periodic supervision of staff at all levels of the district is recommended to deal with non-performing staff.

Declarations

Ethics approval and consent to participate

Not applicable

Consent for publication

Not applicable

Availability of data and materials

All the data analysed are secondary data and are included in this manuscript.

Funding

Not applicable.

Authors' Contributions

Roland Nuotol Kuuzagr is the main author of the study. Co-authors; Raouf, Shauib, Jatoe and Barffo did participate in the study by reviewing and editing the content of the manuscript. The final article was read and approved by all the authors.

Authors' Information

Not applicable

Endnotes

Not applicable

Competing Interests

The authors declare there are no competing interests.

Acknowledgement

The authors acknowledge the special contributions of the reviewers for their comments and suggestions.

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