

Factors associated with management of pneumonia among children by Community Health Workers in Abim district, Uganda

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ABSTRACT

Introduction: Pneumonia is a leading cause of death among children under five years of age in Uganda. Community Health Workers (CHWs) can prevent pneumonia deaths if they know how to manage the disease correctly. We conducted a study to determine factors associated with management of pneumonia among under-five year children by CHWs in Abim district, Uganda. **Methods:** This was a cross sectional study. We obtained data from 374 CHWs using a training video, questionnaire, Sick Child Job Aid (SCJA) and case vignettes. We determined the proportion of CHWs that correctly managed pneumonia. Modified Poisson regression established factors associated with management of pneumonia in children by CHWs. We conducted four key informant interviews with CHWs focal persons, and five focus group discussions with community members. **Results:** We found that 15.5% of CHWs correctly managed pneumonia among children as per the SCJA. In addition, 73.8% of the CHWs respiratory rate counts were close to the respiratory count of the training video with +/- five range. Educational level (Adj. PR 2.06; 95% CI: (1.18-3.61) p-value 0.011), having a CHW register (Adj. PR 0.54; 95% CI (0.30-0.98) p-value 0.041) and drug stock outs (Adj. PR 4.24; 95% CI (1.37-13.13) p-value 0.012) were significantly associated with CHW management of pneumonia. Refresher training, availability of equipment and supplies, and support supervision were the main health facility factors influencing management of pneumonia. Perceptions that CHWs could not manage pneumonia among children, drug stock outs, and lack of trust were community factors influencing CHW management of pneumonia. **Conclusion:** A low proportion of CHWs correctly managed pneumonia among children. Strategies to improve provision of CHW registers, drugs, support supervision, refresher trainings, as well as recruiting CHWs with a minimum of secondary level of education are necessary to improve management of pneumonia among children. Communities also need to be sensitised on roles and responsibilities of CHWs in management of pneumonia.

KEYWORDS: Village Health Teams, Community Health Workers, Pneumonia, Management of Pneumonia, Acute Respiratory Timers, Case Vignettes, Uganda

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Introduction

Pneumonia accounts for 15% of all childhood deaths, and kills more children than any other infectious disease worldwide, with an estimated 935,000 deaths of children under five years attributable to this infection [1]. Pneumonia is the second leading cause of death among children under five years of age in Uganda [2]. Evidence suggests that proper management of pneumonia by Community Health Workers (CHWs) could result in a 70% reduction in mortality from the disease in children under five years [3]. The role of a CHW is to promote health and wellbeing of members, working in close relationship with other health workforce in the health care system [4]. CHWs have different names in different countries, and in Uganda are known as Village Health Teams (VHTs) they implement various activities such as community mobilisation, management of childhood illnesses, and referral of patients to health facilities. The Ministry of Health (MoH) recognises CHWs as the first contact of communities with the health system [5].

To reduce pneumonia morbidity and mortality, Uganda introduced CHWs in 2011. Abim district introduced CHWs in the same year and trained them on Integrated Community Case Management of childhood illnesses (ICCM) in 2014. In pneumonia management, ICCM is a strategy to save children through early diagnosis and improved treatment. ICCM supports pneumonia management by: (i) making amoxicillin drugs more accessible; (ii) ensuring timely care seeking; (iii) enabling compliance with recommended treatment and/or referral; and (iv) creating support by community structures, partnerships and national policies [6].

According to the ICCM policy, CHWs are required to screen for fast breathing using a respiratory timer in all children presenting with cough or difficulty in breathing. CHWs are required to manage children with non-severe pneumonia as per guidelines in the Sick Child Job Aid (SCJA). The policy does not allow CHWs to treat children 0-2 months old hence any such sick child should be referred to a health facility. For children aged 2-11 and 12-59 months, a respiratory rate greater than or equal to 50 breaths per minute, and greater than or equal 40 breaths per minute respectively indicates suspected pneumonia. Severe pneumonia is diagnosed when a child has both pneumonia and a danger sign such as inability

to eat or drink. ICCM guidelines state that CHWs should give all children with severe pneumonia the first dose of amoxicillin and refer immediately to health facilities. These ICCM guidelines allow CHWs to manage non-severe pneumonia. CHWs manage non-severe pneumonia by giving two tablets of amoxicillin 125 mg daily for 5 days to children aged 2-11 months, and three tablets of amoxicillin 125 mg daily for 5 days to children aged 12-59 months.

Studies hypothesise that individual, health facility and community factors affect CHW management of pneumonia. Individual factors cited include age, education, gender, marital status, and wealth of the CHWs. Literature shows that marital status and being female affects CHW management of pneumonia [7]. In addition, other studies theorise that sex was associated with correct management of childhood illnesses [7,8]. Other studies suggest that CHWs who are above 40 years old managed childhood illnesses better than those who are less than 40 years old [9]. CHWs who have attained secondary education or higher are more likely to manage pneumonia as per guidelines when compared to their colleagues with only primary level or no formal education [10,11]. In addition, having knowledge and the ability to put that knowledge into action affected CHW management scores in management of pneumonia [10,12-15]. Health facility factors that affect management of pneumonia include regular support supervision [10,12,16,17], good relationship with health facility staff [13,18,19], and having equipment and supplies [10,13,17]. In addition, studies have shown that giving incentives to CHWs as well as presence of motivation schemes affects their pneumonia management scores [10,11,14,18]. Community factors that affect the ability of CHWs to manage pneumonia include community respect and support, and patient characteristics [8,13,14,17,19]. Trusted and respected CHWs manage pneumonia better than their untrusted counterparts [17]. In addition, patient characteristics also affect a CHWs ability to manage them when they have pneumonia. For example, a crying and restless child can make it difficult for a CHW to screen them for pneumonia.

Few studies in Uganda have investigated performance of CHWs managing pneumonia in their usual work setting, several years after their initial ICCM training. These studies mainly reviewed existing CHW data, were facility based and

presented general factors affecting CHWs but were inconclusive on specific factors that affect CHW performance in management of pneumonia [8,13,19-22]. The aim of this study was to assess factors associated with management of pneumonia among children by CHWs to guide interventions aimed at reducing morbidity and mortality from the disease.

Methods

Study area and setting

We conducted the study in Abim district, which is located in Karamoja region in Eastern Uganda. Karamoja region had consistently demonstrated the nation's lowest scores on key development and health indicators such as health, wealth and food security[22]. Over 70% of the population in Karamoja region experiences critical food insecurity[22], and over 90% of people in the region are classified as poor and vulnerable as opposed to just under 11% in Kampala, the capital city [23]. The literacy rate of the region is 12% compared to a 71% national average [23]. The district, which became functional on 1st July 2006, was part of Karamoja province. The district is composed of one county (Labwor), six Sub counties (Abim Town Council, Alerek Sub County, Lotuke Sub County, Morulem Sub County and Nyakwae Sub County), 32 parishes and 309 villages. In 2011, the district had 15,569 households [24] Abim Town Council had the least number of households (i.e., 1,226 households) while Lotuke Sub County had the highest number of households (i.e., 4,215 households). According to 2014 national census, the population of Abim was 107,966 [24]. The study population were CHWs who were 618 in number in the district, while key informants were health workers, and community members participated in focus group discussions. The study involved CHWs who were in the ICCM programme for more than six months by the time of the study.

Study design

This was a cross sectional study that employed both quantitative and qualitative methods of data collection which enabled triangulation of results to improve on internal validity [25].

Sample size and sampling procedure

Sample size was calculated using the formula for cross sectional studies [26]. We recruited a sample of 374 CHWs basing on the following assumptions: a two-sided test with precision of 5%; and a level of performance of CHWs of 30% from a previous study [20]. The study used simple random sampling to select three sub counties out of the six in the district. We obtained the sampling frame (lists of CHWs managing childhood illnesses including pneumonia per parish) from health facilities situated in the three selected sub counties. Computer generated lists supported selection of 374 CHWs (two from each of 187 villages involved in the study). Eligible CHWs were located through their supervisors and local council leaders. We also conducted four Key Informant Interviews (KII) and five Focus Group Discussions (FGDs). These KIIs and FGDs were sufficient to reach data saturation. The in-charges of health facilities in the study area (health workers) were the key informants, while community members from the selected sub-counties participated in the FGDs.

Study tools and data collection

We used a questionnaire to collect data from the CHWs. The study adopted some parts of a questionnaire used in a similar study conducted in eight districts in central Uganda [27]. The researchers translated the questionnaire to the local language (Lebthur), and back translated to English to ensure the meaning was not lost which preserved reliability and validity of the tool. KII and FGD guides were developed to support collection of qualitative data. The principal investigator pretested the data collection tools (questionnaire, KII and FGDs guides) in a parish not selected for the study.

We collected data by observing and recording the respiratory count of each CHW against a training video. The video used for the study was of a six-month's old child called Wumbi. The breath per minute count of Wumbi (training video count) was 66 breaths per minute. Data collection forms captured the breaths per minute count of each CHW. A CHW got a correct count score if his/her breaths per minute count was within +/- 5 breaths from that of the training video. Any CHW counts above or below +/- 5 breaths margin was recorded as wrong counts. All the CHWs were asked to state the

respiratory cut offs used to screen for pneumonia in children of the following age categories: (i) 0 - 7 days (ii) 2 -11 months; and (iii) 12-59 months who presented with cough. The study asked these questions to test CHWs ability to differentiate between fast and normal breathing using an Acute Respiratory Infection (ARI) timer.

During the experiment, all respondents also received case vignettes [28,29] of under five year old children named Job, Musa and Rose. All respondents then progressed to screen, classify, and treat the three children using the breaths per minute, age, and conditions of each of the cases below. Job had fast breathing (55 bpm) and two danger signs. Job had cough for more than 21 days and was vomiting everything given. Any CHW who answered that Job had fast breathing when classifying got a mark. The correct “management” for Job was referral to a health facility. A CHW got a mark for answering that Job needed referral (with or without pre referral treatment), while any other answer, was not correct. Musa had fast breathing (55 bpm), with no danger sign. All CHWs who answered that Musa needed treatment with amoxicillin got a mark. A CHW who answered that Musa needed referral got zero marks because ICCM manual clearly states that a CHW must manage a child of Musa’s condition. Rose had mild cough with no fast breathing. All CHWs who answered that Rose was breathing normally when classifying got a mark. Any CHW who said Rose did not need amoxicillin got a mark. According to the manual, a child of Rose’s nature required no treatment, hence CHWs are required to give advice to the caregiver on alternative cough remedies, like taking honey amongst others. The KIIs were conducted at health facilities, while FGDs were held in the community. The principal investigator audio recorded the interviews and group discussions, we well as took notes.

Study variables

The reference document for CHW management of pneumonia in this study was the Sick Child Job Aid (SJCA). The SCJA is a pneumonia management manual that CHWs use for managing children with pneumonia. It states respiratory cut offs, danger signs and pneumonia management guidelines for specific age groups. The dependent variable of the study was correct management of pneumonia by a CHW. Correct management of pneumonia was

measured by observing how many CHWs could correctly screen, correctly classify and prescribe correct treatment in each of the three children described in case vignettes. We used three case vignettes and a training video to assess CHWs ability to screen, classify and treat children with suspected pneumonia. Independent variables were individual, health facility and community factors.

Data management and analysis

Quantitative data were entered in Microsoft excel and exported to STATA 13 for analysis. In univariate analysis, proportions and percentages were determined. The principal investigator summarized descriptive results as frequencies, percentages or median with interquartile range (IQR). Modified Poisson regression identified significant factors associated with CHWs management of pneumonia among children. We applied Modified Poisson regression because the prevalence of the outcome was greater than 10% [30]. Frequencies determined overall agreement of treatment given between CHWs and training video counts, indicating the proportion of children observed who got correct classification. Qualitative data were analysed manually using content analysis. Transcripts from notes taken in the field and audio recording provided information for analysis. Repetitive reading of transcripts gave a clear understanding of emerging issues that led to development of codes and themes. Two researchers verified transcriptions by listening to them for consistency. Qualitative data supplemented the quantitative data hence helping to explain facility and community factors that influenced management of pneumonia.

Ethical considerations

We obtained ethical approval from Makerere University School of Public Health Higher Degrees, Research and Ethics Committee (HDREC). In addition, the District Health Officer of Abim gave permission to conduct the study. We obtained written informed consent from all respondents after clearly explaining to them the purpose of the study. The principal investigator kept all transcripts and filled questionnaires confidentially. Study respondents received identification numbers for privacy, which improved their participation, and

they knew that they could withdraw from the study at any time if they wanted to.

Results

Socio demographic characteristics of Community Health Workers, Abim district

We collected data from 374 CHWs in three sub-counties in Abim district, of which 56.4% (211/374) were male. The mean age of the CHWs was 35.57 years with a standard deviation of 10.54, the youngest being 19 and oldest 70 years. In addition, 67.91% (254/374) of the CHWs were Catholics, and 94.39% (353/374) were married. Among the CHWs, 39.30% (147/374) attended primary school, 91.18% (341/374) were farmers, and 10.70% (40/374) had no respiratory timers [Table 1](#).

Management of pneumonia among children by Community Health Workers

All the 374 CHWs participated in making their own independent respiratory counts in diagnosis of pneumonia. Among them, only 2.4% (9/374) had counts that were equal to that of the video 66 bpm (breaths per minute). On further analysis, 73.8% (276/374) of the CHW counts were within the allowable +/- five breaths per minute (bpm) of the video count of 66 bpm. Furthermore, 24.33% (91/374) CHWs counts were less than +/- five breaths per minute margin, and 1.87 % (7/374) of CHW counts were above the margin [Table 2](#).

Individual and health facility factors associated with Community Health Worker management of pneumonia

Cross tabulations established that amongst CHWs who correctly managed pneumonia, 15.52% (9/58) lacked registers. Among CHWs who had registers, 38.60% (132/342) had primary or no education compared to 61.40% (210/342) who had secondary or tertiary education. Among CHWs who correctly managed pneumonia, 75.85% (44/58) had secondary or tertiary education compared to 21.14% (14/58) that had primary or no education. Amongst CHWs who had drug stock outs, 39.67% (121/305) had primary or no education compared to 60.33% (184/305) who had primary education. We found that education level was significantly associated with

management of pneumonia at bivariate analysis. CHWs with secondary education or higher had a prevalence of correct management of pneumonia that was 2.03 times higher than those with only primary or no education (Unadjusted Prevalence Ratio (Unadj. PR) 2.03; 95% CI: 1.16 - 3.58, p value 0.014). CHWs who received feedback after support supervision had a prevalence of correct management of pneumonia that was 0.61 times lower than those who did not (Unadj. PR 0.61; 95% CI: 0.38-0.99, p value 0.046). CHWs who reported drug stock outs had a prevalence of correct management of pneumonia that was 4.15 times higher than those who had drugs (Unadj. PR 4.15; 95% CI: 1.33-12.89, p value 0.014). CHWs who had registers had a prevalence of correct management of pneumonia that was 0.51 times lower than those who did not (Unadj. PR 0.51; 95% CI: 0.28-0.94, p value 0.031).

After adjusting for confounders, educational level, having a CHW register, and drug stock outs were significantly associated with correct management of pneumonia. CHWs with secondary or tertiary education had a prevalence of correct management of pneumonia that was 2.06 times higher than those with primary or no education Adjusted Prevalence Ratio (Adj. PR 2.06; 95% CI: 1.18-3.61, p-value 0.011). The prevalence of correct management of pneumonia amongst CHWs with registers was 0.54 times lower than those that did not have them (Adj. PR 0.54; 95% CI: 0.30-0.98, p-value 0.041). CHWs who reported drug stock outs had a prevalence of correct management of pneumonia that was 4.24 times higher than those who had drugs (Adj. PR 4.24; 95% CI: 1.37-13.13, p-value 0.012) [Table 3](#).

Health workers generally agreed that CHWs that were more educated performed better than the less educated ones. The key informants attributed this to the fact that it is easier to explain to an educated CHW concepts in pneumonia management than a less educated one. It was stressed that uneducated CHWs find it harder to understand key concepts because training materials are normally in English, and it is difficult to translate some terminologies into the local language or context for them to understand. The uneducated CHWs were also incompetent regarding completing registers, sometimes getting support from the educated colleagues.

“It’s very hard to teach uneducated CHWs. During selection of these CHWs, the guidelines are very clear.

ICCM guidelines state that communities should select only persons who can read and write for them to be trained as a CHW. However, some villages had difficulty in selecting a suitable person, so they sent those who could say some few English words. In other cases, the Local Council 1 chairperson selected a person of their own preference, who did not meet the criteria. If you look at the registers of the uneducated CHWs, they are full of mistakes. Some of the uneducated CHWs use other educated non CHWs to fill their register books usually making many mistakes.” Health worker

Health facility factors affecting Community Health Workers’ management of pneumonia

The qualitative findings revealed that support supervision, refresher training, incentives, limited expertise of health workers, as well as availability of equipment and supplies were health facility factors that affected management of pneumonia among CHWs. In addition, community perceptions that CHWs could not correctly manage children with pneumonia were community factors affecting CHW management of pneumonia.

Support supervision

The health workers said that the district health office last carried out support supervision of CHWs over two years ago, and that they did not have any clear routine supervision schedule. One of the reasons noted for ending this supervision was that a non-governmental organisation (NGO) that was supporting this activity had withdrawn from the district. In addition, the health workers noted that there were no monthly meetings held with CHWs making monitoring of performance difficult. This study noted that CHWs performed poorly in pneumonia management due to lack of support supervision.

“I heard that the only organisation that supported CHWs activities withdrew from funding CHWs activities in the district. Our district does not have any budget for CHWs activities, so since that organisation left, I have never seen any district official coming here to supervise CHWs like before. The last time they came here for support supervision I think was over two years ago.” Health worker

Refresher trainings

The health workers agreed that CHWs, irrespective of whether they were old on the job or replaced another CHW, needed constant refresher trainings to improve their management of pneumonia cases among children. The study noted that refresher trainings were good for CHWs because health workers use them to remind CHWs of key concepts in pneumonia management. In addition, findings revealed that refresher trainings were also necessary to reduce turnover amongst CHWs.

“Ever since the CHWs were trained in 2014, I do not remember if there was any refresher training on pneumonia management conducted. What we used to do is use the opportunity of review meetings to remind CHWs of key concepts in ICCM. Generally, the district does not conduct refresher trainings.” Health worker

Incentives for CHWs

The key informant interviews established that during the training of CHWs, the district promised to give them some financial incentives during monthly meetings. However, for over two years, there were hardly any financial incentives provided to the CHWs. It was also established that MOH did not provide funds for CHW activities. The district therefore only received funding from NGOs to support the work of CHWs. One such NGO was working with only one CHW involved in ICCM out of the two per village involved, leaving the other one idle. It was also established that supporting only the CHWs involved in ICCM had demotivated the others who were intended to be primarily involved in health education and promotion. Many of the unsupported CHWs therefore did not perform their responsibilities nor submitted reports on time, while others left the programme.

Limited expertise of health workers

Health workers reported that there were differences between CHW training and what they received in medical schools. For example, ICCM training for CHWs introduced colour-coated drugs, ARI timers and other procedures that health workers did not know much about. Most health workers said that they did not fully understand the ICCM manual, which affected support supervision offered to CHWs.

“When a CHW comes to you for consultation, she will say give me blue Coartem, or yellow Coartem yet we do not know the dosage and what advice to give them. Medical schools did not teach us about colour-coated drugs, respiratory timers and ICCM in general. So most of us do not fully understand the ICCM programme. It therefore makes it hard for us to supervise the CHWs effectively. The next time they train CHWs on ICCM, the trainers should also train all health workers in the district so as to be able to supervise the CHWs accordingly.” Health worker

Equipment and supplies

Some CHWs lacked respiratory timers while others did not have register books and referral tools. In addition, stock outs of amoxicillin used for treating pneumonia by CHWs existed in the whole district varying from weeks up to four months. Most CHWs had spoilt medicine kits (wooden boxes) for keeping ICCM drugs which resulted in poor storage.

“There is a problem of drug stock out in this district. National Medical Stores (NMS) supplies drugs quarterly. However, they bring very few doses that the community uses in a weeks’ time. We (health workers) have no option rather than give each CHWs some drugs meant to be for the health facility. It would be better if government supplied enough drugs for CHWs for three months.” Health worker

Most community members agreed that stock outs of drugs among CHWs existed, and sometimes lasted for up to a period of 4 months. The community members added that when CHWs got drugs from the health facility, these drugs did not last long hence used within a few days. The community members added that due to persistent drug shortages, some CHWs had resorted to “rationing” drugs so that at least more community members get some. In some instances, a child who was supposed to get a complete dose for 5 days will only receive dosage for 2 days, the balance given to another child. At times, due to drug shortages, a CHW referred a patient to a health facility, but the in-charge told the client to go back to the CHW for drugs. This issue of referring patients back to CHWs sometimes confused community members. These clients most times went back to their villages without treatment. In addition, some caregivers of sick children did not complete the dosage like the CHW instructed, while others did not follow time schedules or forgot to give children drugs at specified times. It also emerged from the group

discussions that most times caregivers discontinued treatment when they saw some improvement in the child after about two days of taking the medication.

“I went with my sick child to a health facility for treatment. Can you believe the health worker chased me from the health facility? She told me to go and look for a CHW, saying CHWs could treat my child. Now when I reached the CHWs place, he told me he did not have drugs! What is wrong with these health workers?” Community member

Community perceptions on management of pneumonia by Community Health Workers

Community members identified pneumonia, as a disease that “goes with cough”, made a child develop fever, and made the child breath very fast. They said that pneumonia affected a child’s lungs, and that the child consequently had “difficulty in breathing”. Community members said that CHWs did not have capacity to treat pneumonia. The community members said CHWs do not treat children with pneumonia because they cannot inject children. Community members believed that an injection (on the arm) was the only way to manage pneumonia. Community members admitted that many CHWs had ARI timers but that that equipment only measured the extent of the respiratory condition.

“Pneumonia is a difficult disease. The only way to treat pneumonia is through an injection on the arm. Our CHWs do not know how to inject children, so they cannot treat a child with pneumonia. For me, whenever I think its pneumonia, I take my child to a government health facility.” Community member

Discussion

The results of the study show that performance of CHWs in management of pneumonia was sub optimal. One in Seven CHWs provided correct management of pneumonia as per the Sick Child Job Aid (SCJA). Educational level of CHWs, having a CHW register, and drug stock outs were individual factors associated with correct management of pneumonia. The qualitative findings revealed that refresher training, drug stock outs, availability of equipment and supplies, and support supervision were health facility factors that supported

management of pneumonia. In addition, community perceptions that CHWs could not correctly manage children with pneumonia, and trust were community factors affecting CHW management of pneumonia.

We found that 15.51% (58/374) of CHWs could provide correct management of pneumonia to children in Abim district as per the SCJA. The findings of our study agree with Wanduru et al [11] who reported that only 11.7% of CHWs managed pneumonia as per the SCJA, while Bagonza et al [8] reported that only 21.7% of CHWs could manage children with pneumonia. The findings from our study disagree with findings in Kenya that reported an average management of childhood illness of 57.85% [19]. This difference could be because Rowe et al., [19] observed CHWs in a Kenyan health facility, which is not a CHWs usual workplace in the Uganda context, and the study used recall method for data collection. Our study used case vignettes, which test current knowledge of CHWs, without having to recall past information. Recall method of data collection is prone to bias, as respondents may not always remember in detail what happened in the past. The findings of our study show that few CHWs in resource-limited settings provide correct management of pneumonia. This implies that CHWs are not meeting the ICCM target, which states that 80% of CHWs should provide correct management of pneumonia. This suggests that the Ministry of Health and partners should implement corrective measures to address gaps identified in CHW management of pneumonia, with the aim of increasing the proportion of CHWs who correctly manage the disease.

Our study found that 73.8% of the CHWs respiratory rate counts were within \pm five of the count in the training video. These findings agree with that by Kallander et al [31] who reported that 71% of the CHW counts were within \pm five breaths/min from the gold standard. The challenge CHWs had was classifying whether a child had fast breathing or not, taking into consideration the age of the child. This is a critical finding because knowing how to count respiratory rates without knowledge of how to use the information to classify whether that child has / does not have pneumonia is meaningless. Training of CHWs on how to interpret respiratory rates and classify children with pneumonia correctly is therefore particularly important. District Health Officers and other stakeholders should therefore

prioritise training CHWs on how to interpret respiratory counts.

This study established that CHWs with secondary level of education were significantly associated with correct management of pneumonia. CHW studies in Myanmar [10] and other parts of Uganda [11] reported similar findings that level of education was associated with CHW performance in correct management of pneumonia. CHWs with secondary level of education are more likely to understand English and read any Information, Education and Communication (IEC) materials that they are given. CHWs with secondary level of education understand better key concepts in management of childhood illnesses when compared to their colleagues with primary level or no formal education. Districts and other CHW partners should therefore emphasise recruitment of individuals into the ICCM programme who have secondary level of education or higher.

Our study found that having a CHW register was significantly associated with pneumonia management. This finding is logical because the register is a tool that records and evaluates CHWs management of pneumonia. Using their registers, supervisors of CHWs (health workers) can easily identify weaknesses in the process and take corrective action. Related studies in Uganda and Mozambique identified that having registers and tools to perform work determined CHW pneumonia management scores [13,17]. Data from our study shows that CHWs who reported having registers performed worse than those who lacked registers. CHWs who were not providing correct management of pneumonia, or actively involved in managing pneumonia in children, treated less children and therefore expected to have register books. Indeed, these CHWs still had their register books because they were not managing pneumonia and therefore not using them for recording treatment data. This finding indicates that some CHWs were not using their register books because it is unlikely that one can have an unused register book, yet the district had last supplied them more than a year ago. On the other hand, CHWs who were active in ICCM and provided correct management of pneumonia treated more children hence used up their register books. The significance of having a register book for supervising and evaluating a CHW regarding management of pneumonia cannot therefore be

underestimated. Health authorities should therefore ensure that register books are always available for CHWs to perform their duties.

Previous studies conducted in Uganda and elsewhere showed that drug stock outs were significantly associated with pneumonia management [8,10,13]. Our study similarly identified drug stock out as a significant factor in management of pneumonia. Indeed, 70% of the respondents said they lacked amoxicillin drugs during the time of the study. Indeed, our study area did not meet the ICCM objective of ensuring that 60% of CHWs have drugs for treatment of pneumonia. MoH through National Medical Stores should procure sufficient drugs and leave buffer stocks of at least three months for CHWs to enhance management of pneumonia among children. Since only 15.51% of CHWs correctly managed pneumonia, the other CHWs that did not correctly manage pneumonia reported drug stock outs as the main constraint. Drug stock outs for pneumonia could also be attributed to the fact that between 2% to 35% of children under five years receive antibiotics for treatment of a non-existent pneumonia [20,32]. To mitigate drug wastage, district health authorities should enforce strict adherence to pneumonia treatment guidelines.

CHWs in the district performed poorly in management of pneumonia due to lack of supervision as has been found in other studies [10,11,16]. Indeed, CHWs in our study reported that their respective health facilities and the district had only conducted support supervision activities in two years prior to the survey. During support supervision, CHW supervisors can easily identify mistakes regarding management of pneumonia and take corrective actions. In the absence of supervision, CHWs continue to make mistakes. Abim district failed to supervise CHWs quarterly, as stated in ICCM policy objectives. District health authorities therefore need to implement this policy to improve management of pneumonia among children.

Closely related to lack of supervision is lack of refresher trainings, which influenced CHW management of pneumonia in our study. These findings agree with studies conducted in Kenya and Uganda which found that lack of refresher trainings, affected CHW performance in management of

childhood illnesses [9,16,33]. Due to lack of refresher trainings, CHWs were treating children with danger signs instead of referring them as stipulated in the guidelines. Health workers confirmed that children suspected of having pneumonia were not being screened, children without pneumonia were given pneumonia drugs, and genuinely sick children were receiving low dosage of drugs contrary to the guidelines in the ICCM manual [6]. This lack of adherence to treatment guidelines by CHWs not only affects management of pneumonia but also leads to misuse of drugs hence unknowingly contributing to antimicrobial resistance (AMR) [34]. Our study findings show that 73% of CHWs did not know how to classify whether a child had pneumonia or not using respiratory cut off points. These CHWs classified children with normal breathing, as having first breathing. During answering case vignettes, CHWs who got wrong scores were treating children with cough and normal breathing rates with amoxicillin. These prescription practices indicate misuse of amoxicillin therefore contributing to antimicrobial resistance [35] and drug wastage. AMR threatens our ability to treat common infectious diseases, resulting in prolonged illness, disability, and death [34]. MOH therefore needs to take decisive action on management of pneumonia by CHWs as a precaution against AMR and drug wastage.

Some health workers reported that ICCM treatment guidelines for pneumonia were different from the training they received in health training institutions. According to health workers, the ICCM programme introduced new colour coated drugs, data collection tools, respiratory timers and treatment guidelines that were different from the standard management of pneumonia procedures health workers received while being trained. This is a unique finding from our study which warrants more research. As noted earlier in the discussion, support supervision is important for improving CHW management of pneumonia scores. However, if the people who are to conduct support supervision of CHWs do not fully understand what they are supposed to supervise it is bad, this gap needs urgent attention. District health authorities and implementing partners should therefore consider training all health workers on the ICCM programme.

Our study established that community trust influenced CHW pneumonia management performance. Several studies also reported that trust from community members influenced CHW management scores [8,13,14,17,18,36]. Indeed, CHWs who were not trusted by the community received fewer children for treatment. Communities do not trust some CHWs in management of pneumonia because they believe CHWs can not treat pneumonia, and those they do not trust can harm their children. Some of the reasons expressed for distrust include drunkenness, inability to read or write, CHWs having conflicts with community members amongst many other reasons. Community trust is therefore critical for the success of the ICCM programme in Adim district and other parts of the country. Abim District should therefore consider implementing strategies that build community trust on CHWs such as sensitisation communities on roles and responsibilities of CHWs in management of pneumonia.

Our study had some strengths and weaknesses. Among the strengths, our study was conducted in the homes of CHWs, several years after initial ICCM training. This aspect is a strength because the study occurred in the usual work setting of a CHW, and not in a health facility as other studies have done. In addition, since the study occurred several years after initial training, it allowed the investigators to assess whether the CHWs still have the skills in management of pneumonia, that they got a long time ago since they commenced involvement in ICCM. The study addressed issues of non-uniformity in scoring by ensuring that all study respondents answered the same case vignettes and used the same standard video to assess CHW ability to count breaths per minute of a child which is another strength of the study. One of the weakness of our study is that actual observations of CHW treating children at home was impractical. Nevertheless, the case vignettes gave a good alternative to assessment of the level of skills of the CHWs in diagnosing of pneumonia. The results from our study depict CHW pneumonia management issues in resource-constrained areas and can inform future studies in similar settings.

Conclusion

A low proportion of CHWs correctly managed pneumonia as per guidelines in the SCJA. Educational level, having a CHW register book, and drug stock outs were significantly associated with management of pneumonia. Health and community factors influencing management of pneumonia included refresher training, support supervision and community trust. Strategies that increase the proportion of CHWs who can correctly manage childhood pneumonia are needed. These strategies may include recruiting CHWs that are more educated, providing CHWs with register books, ARI timers, and drugs, as well as conducting quarterly support supervision, and building strong community trust.

What is known about this topic

- A number of studies in Uganda have already investigated the performance of CHWs managing pneumonia in their usual work setting.
- CHWs have been trained to screen for fast breathing using respiratory timers in all children presenting with cough or difficulty in breathing.

What this study adds

- This study adds a detailed analysis of the proportion of CHWs that could correctly manage pneumonia in a setting where the CHWs themselves work.
- Previous studies reviewed existing literature on CHWs data and were mainly facility based however our study used case vignettes, which was an innovative method.

Competing interests

The authors declare no competing interest.

Authors' contributions

VO wrote the study protocol, supervised the data collection, conducted data analysis, wrote the initial draft of the manuscript, and reviewed the final version of this manuscript. ANK and DM reviewed

the study protocol and all the drafts of the manuscript.

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Tables

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Table 1: Socio demographic characteristics of Community Health Workers in Abim district, Uganda, 2018

Variable	Frequency (N = 374)	Percentage (%)
Age of respondents (years)		
19 – 26	38	10.20
27 – 34	132	35.30
35 – 42	101	27.01
43 – 50	62	16.58
51 – 71	41	10.96
Gender		
Male	211	56.42
Female	163	43.58
Marital status		
Single / widowed	21	5.61
Married	353	94.39
Religion		
Catholic	254	67.91
Anglican	102	27.27
Others	18	04.81
Education level		
Primary / never attended school	147	39.30
Secondary / tertiary	227	60.70
Occupation		
Agriculture	341	91.18
Others	33	8.82

Table 2: Community Health Workers' performance scores in answering case vignettes and video counts in Abim District, 2018.

Case vignettes	Management of pneumonia	
	Wrong N (%)	Correct N (%)
Screening		
Job	142 (37.97)	232 (62.0)
Musa	170 (45.45)	204 (54.6)
Rose	188 (50.27)	186 (49.73)
Classification		
Job	181 (48.40)	193 (51.60)
Musa	199 (53.21)	175 (46.79)
Rose	246 (65.78)	128 (34.22)
Treatment		
Job	198 (52.94)	176 (47.06)
Musa	225 (60.16)	149 (39.84)
Rose	268 (71.66)	106 (28.34)
Training video counts (bpm)	Count	Percentage (%)
Less than 61	91	24.33
61-71	276	73.80
Above 71	7	01.87
Count no. of breaths per minute	Average count of CHWs	Count of Training video
	61.2 bpm	66 bpm
Average performance in screening, classifying, and treating Job, Musa and Rose		
Procedure	Percentage (%)	
Screening	55.44	
Classification	44.21	
Treatment	38.41	
Average management of all children by all the CHWS	46.11	
Proportion of CHWs that could manage a child with pneumonia		
Correct management of pneumonia	58/374 (15.51%)	
Wrong management of pneumonia	316/374 (84.49%)	

Table 3: Factors associated with management of pneumonia by Community Health Workers in Abim District, 2018

Variable	Management		Unadjusted PR (95% CI), P value	Adjusted PR (95% CI), P value
	Wrong n (%)	Correct n (%)		
Age of respondents (years)				
19 – 26	33 (86.84)	5 (13.16)	1	
27 – 34	108 (81.82)	24 (18.18)	1.38 (0.56-3.38), 0.479	
35 – 42	86 (85.15)	15 (14.85)	1.12 (0.44-2.90), 0.801	
43 – 50	55 (88.71)	7 (11.29)	0.85 (0.29-2.52), 0.780	
51 – 71	34 (82.93)	7 (17.07)	1.30 (0.45-3.75), 0.630	
Gender				
Male	176 (83.41)	35 (16.59)	1	
Female	140 (85.89)	23 (14.11)	0.85 (0.52-1.38), 0.514	
Marital status				
Single / widowed	18 (85.71)	3 (14.29)	1	
Married	298 (84.42)	55 (15.58)	1.09 (0.37-3.20), 0.875	
Religion				
Catholic	214 (84.25)	40 (15.75)	1	
Anglican	87 (85.29)	15 (14.71)	0.93 (0.54-1.61), 0.807	
Others	15 (83.33)	3 (16.67)	1.05 (0.36-3.09), 0.918	
Education level				
Primary / none	133 (90.48)	14 (9.52)	1	1
Secondary / tertiary School	183 (80.62)	44 (19.38)	2.03 (1.16 – 3.58), 0.014*	2.1 (1.20-3.70), 0.010*
Received feedback after supervision				
No	80 (78.43)	22 (21.57)	1	
Yes	236 (86.76)	36 (13.24)	0.61 (0.38-0.99), 0.046*	
Received non-financial incentives				
Yes	288 (85.46)	49 (14.54)	1	
No	27 (75.00)	9 (25.00)	1.72 (0.92-3.20), 0.088	
Drug stock out				
No	100 (90.09)	11 (9.91)	1	1
Yes	215 (82.06)	47 (17.94)	4.15 (1.33-12.89), 0.014*	4.24 (1.37-13.13), 0.012*
Had a CHW register				
No	23 (71.88)	49 (28.13)	1	1
Yes	293 (85.67)	9 (14.33)	0.51 (0.28-0.94), 0.031*	0.47 (0.28-0.82), 0.007**
Key: *p < 0.05, **p < 0.01, ***p < 0.001				