

Original Research Article

Resource availability for infection prevention in early childhood education centres from Southern Ghana

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Received: 26 August 2016

Revised: 27 September 2016

Accepted: 27 September 2016

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ABSTRACT

Background: Teachers in early childhood education centers are the epitome of care concerning infection prevention for young children in educational programmes. The objective was a comparative descriptive quantitative survey was used to assess the knowledge, practice and resources availability for infection prevention in early childhood education centres in the Suhum Municipality.

Methods: One hundred and sixty (160) teachers from 52 randomly selected early childhood centres; creches, nurseries, day cares and kindergartens were recruited for the study and assessed for resource availability for infection prevention.

Results: The findings of the study revealed that both public and private teachers in early childhood education centres have a good knowledge about infection prevention measures and control. Knowledge level on infection prevention is comparable between the two categories of teachers ($P=0.200$). However, the high knowledge did not translate into practice due to non-availability of resources for the implementation of infection prevention. It was observed that most of the learning centres visited were overcrowded (exceeded GES recommended 28 children per a teacher ratio). There were also inadequate and inappropriate sanitary facilities in the studied early childhood education centres. The private schools were better resourced than the public schools ($P=0.001$).

Conclusions: It was concluded that caregivers in childhood education centres received adequate training on infection prevention before and during employment. The Ministry Of Education and Ghana Health Service must ensure there are adequate sanitary facilities before approval is given for the running of the programme and regular monitoring must be done to ensure their sustainability.

Keywords: Diapering technique, Hand hygiene, Infection prevention, Microorganism sanitation

INTRODUCTION

The increase demand for female labour coupled with drastic reforms to make basic education compulsory in Ghana since 2003 / 2004 had encouraged the setting-up of early childhood centres; crèches, day cares, nurseries, and kindergartens to take care of children as young as six weeks old. In the public sector early childhood education for children aged 4-6 years has become an integral part of

the formal basic education for teaching pre-school children and has been made compulsory before proceeding to school.¹ In 2007, government policy mandated every primary school to have kindergarten as an integral part of the main stream this increased the numbers of public childhood centres.² Since, 2003 there has been significant increase of 7.6% in public kindergartens as well as private kindergartens annually.²

Nevertheless, several studies show children attending early childhood education centres have increased rate of diarrhoeal as well as respiratory infections due to attitudes of children and caregivers.³⁻⁵ For preventing infections in early childhood centres, an effective infection control and prevention program for an Early Child Education program have multiple components.⁶ These components comprises of; effective hand hygiene, exclusion of ill children as well as staff, immunization, cough and sneeze etiquette, appropriate use of gloves, effective environmental cleaning and staff education as the concept of infection control in early childhood education centres. In other words, these are measures used by teachers to control and prevent infections in the child centres.

In the process of controlling infections in early childhood education centres, caregivers must have a certain level of knowledge on infection prevention whiles they practice according to appropriate standard of infection prevention. However, without the necessary available resources to combat infection in the schools, infection prevention in early childhood education centres cannot be sustained. According to WHO, water alone cannot directly remove hydrophobic substances such as fats and oils, which often present on soiled hands even though, water is often called a “universal solvent”.⁷ Appropriate hand washing therefore involves the use of soaps or detergents to dissolve fatty materials and facilitate their subsequent flushing with water. Thus, water alone is not suitable for cleaning soiled hands; soap or detergent must be applied as well as water. Health Protection Agency also recommends staff and children in early childhood education centres to use liquid soap and disposable paper towels during hand washing whereby sharing bars of soap and towels can spread microorganism from one person to another.⁸ In the absence of water and soap, hand hygiene performed with the use of alcohol hand rub has been recommended. WHO is of the view that although, washing hands with soap and water remains an accepted method for routine hand antisepsis, alcohol-based handrubs should be promoted as the gold standard for hand hygiene considering, in particular, their dramatic impact on improving compliance with hand hygiene and ensuring clean, safe hands.⁹ Correa and colleagues studied 42 childcare centres where there was a sporadic limited availability of water, non-functioning sink and a maximum population of 30 children, found out that, gastrointestinal diseases were reduced by 30%.¹⁰ In the same way, the use of alcohol hand rub was cheaper to that of soap dispenser, perceived convenience and satisfaction among teachers of the childhood centre.¹¹ Consequently, an observational study on hand hygiene compliance and environmental determinants in child day care shows that hand hygiene compliances cannot be effective without, number of sinks, number and type of towel and soap facilities, availability of alcohol-based hand sanitizers.¹² The study further found out that the type of towel facilities was significantly associated with hand hygiene.

In the prevention of respiration infection, children and adults are to be encouraged to cover their mouth and nose with a tissue, wash hands after using or disposing of tissues.¹³ American Academy of Pediatrics recommended designated areas only to change diapers which should be separated from any food storage, food preparation area or eating area as well as objects, such as pacifiers, toys, baby bottle.¹⁴ In the same way National Health and Medical Research Council recommends staff to put on disposables gloves before changing of a baby's diaper and thereafter dispose of soiled nappy or diaper with wipe into an individual nappy sack before placing into a bin lined with a plastic liner with a secure lid, operated by a foot pedal.¹⁵ Moreover, if a child needs to be washed completely then a sink with running water, which is thoroughly clean, is needed. Thereafter disinfect the sink as well as changing area with detergent after use.¹⁶

Behavioural change strategies for reducing diarrhoea in out-of-home childcare, study showed that diapering and hand-washing equipment specifically designed to reduce the spread of infectious agents' significantly reduced diarrheal illness among the children and absence because of decreased illness among staff in out-of-home childcare centers.¹⁷ The study went further to state that, the impact of the equipment can add value to the impact of training in proper diaper-changing and hand-washing that has been observed in previous studies.¹⁷

Additionally, structure, cleanliness, and general outlook of latrines are implicated in the rate of utilization of sanitary facilities by the school children.¹⁸ For that reason, effective cleaning with appropriate disinfectant such as household bleach is to prevent the spread of disease and promote health in children as well as staff of the school. UNICEF recommends a ratio of children 20 children to one toilet facility. Similarly, it is recommended, 10 children use one toilet facility that should be accompanied by hand washing facility.¹⁴ The importance of access to safe water and hygiene education should therefore not be underscored in abating water-borne illnesses, school absenteeism, and generally improving the quality of life and learning performance in children.¹⁹ The study therefore aimed at determining the sanitary facilities for infection prevention in early child care centres in the municipality.

METHODS

Study design: The study design employed a descriptive quantitative comparative survey.

Sampling: One hundred and sixty (160) teachers from selected 52 registered private as well public early childhood education centres were randomly selected using a computer-based random number generator after consent has been obtained from respondents.

Sample size calculation: Total population of teachers in early childhood education centres was 255 teachers.

Using a Confidence interval (margin error) of five, 95%, as confident level, percentage of 50% distribution, which is the most conservative, and a constant z- score of 1.96. One hundred and sixty (160) teachers were selected as the target population for the study; 80 teachers were selected from the public schools whereas the other 80 teachers were selected from the private childhood education centres.

Data collection: A comparative descriptive quantitative survey was used to assess the knowledge, practice and resources availability for infection prevention in early childhood education centres in the Suhum Municipality

Data analysis: Due to various non-normality and normality distribution characteristic properties of data, descriptive analysis using mean, mode, and percentages in combination to Mann Whitney U test for non-distributed variables, independent t test and one-way

Anova for normal distributed data from SPSS version 20 was used to analyse data from the study.

RESULTS

Table 1 and 2, show that both the public and private educational centres had inadequate resources with respect to infection prevention. Public childhood education centres recorded a group mean value of 2.077 while's private childhood education centres recorded a group mean value of 2.308. A one-way T- test analysis conducted to compare resources for the two groups showed statistically significant difference in scores ($P=0.001$) 2-tailed. ($M=34.813$, $SD=5.799$) and private teachers ($M=39.125$, $SD=5.235$). The magnitude of the difference was large (eta squared 0.134). This is an indication that Private early childhood centres are better resourced.

Table 1: Availability of resources for infection control in public early childhood education centres.

Statements	Likert scale	Frequency	Percentage	Mean score
Running water is available for school children and teachers to use in washing of hands	Never	5	6.3	2.7125
	Sometimes	13	16.3	
	Always	62	77.5	
	Total	80	100.0	
Source of water for washing of hands are available in basins	Never	21	26.3	2.2875
	Sometimes	15	18.8	
	Always	44	55.0	
	Total	80	100.0	
Functioning Washing sink is available in every classroom.	Never	80	100.0	1.0000
	Total	80	100.0	
Liquid soap in a dispenser is available for use during hand washing	Never	27	33.8	2.0750
	Sometimes	20	25.0	
	Always	33	41.3	
	Total	80	100.0	
Alcohol based sanitizer is readily available for teachers and school children for use during hand washing	Never	36	45.0	1.7250
	Sometimes	30	37.5	
	Always	14	17.5	
	Total	80	100.0	
Disposable tissues are available for wiping of hands after hand washing.	Never	45	56.3	1.6375
	Sometimes	19	23.8	
	Always	16	20.0	
	Total	80	100.0	
Fabric towels are available for wiping hands after washing.	Never	28	35.0	1.9875
	Sometimes	25	31.3	
	Always	27	33.8	
	Total	80	100.0	
Disposable tissues available for cleaning mucous nostrils of children.	Never	26	32.5	2.1750
	Sometimes	14	17.5	
	Always	40	50.0	
	Total	80	100.0	
Different mops are available for cleaning the school kitchen, classroom floor and the toilet.	Never	2	2.5	1.8625
	Sometimes	7	8.8	
	Always	71	88.8	
	Total	80	100.0	
More than one teacher is available in a classroom.	Never	24	30.0	2.0875
	Sometimes	25	31.3	

	Always	31	38.8	
	Total	80	100.0	
Available toilet for schoolchildren and teachers to use.	Never	19	23.8	2.2500
	Sometimes	22	27.5	
	Always	39	48.8	
	Total	80	100.0	
Bleach is available for cleaning the toilet, bathroom and urinal.	Never	11	13.8	2.40000
	Sometimes	26	32.5	
	Always	43	53.8	
	Total	80	100.0	
All Classroom windows have mosquito proof net available	Never	70	87.5	1.2125
	Sometimes	3	3.8	
	Always	7	8.8	
	Total	80	100.0	
Dustbins in every class with well-covered lid are available for rubbish collection.	Never	18	22.5	2.2250
	Sometimes	26	32.5	
	Always	36	45.0	
	Total	80	100.0	
Clean drinking water is available for the children	Never	5	6.2	2.7375
	Sometimes	11	13.8	
	Always	64	80.0	
	Total	80	100.0	
Good ventilation available	Never	2	2.5	2.8625
	Sometimes	7	8.8	
	Always	71	88.8	
	Total	80	100.0	

Group mean of responses from teachers in public childhood education centres = 2.176.

Table 2: Availability of resources for infection control in private early childhood education centres.

Statements	Likert scale	Frequency	Percentage	Mean score
Running water is available for children and teachers to use in washing of hands	Never	5	6.3	2.6875
	Sometimes	15	18.8	
	Always	60	75.0	
	Total	80	100.0	
Source of water for washing of hands are available in basins	Never	15	18.8	2.5125
	Sometimes	9	11.3	
	Always	56	70.0	
	Total	80	100.0	
Functioning Washing sink is available in every classroom	Never	80	100	1.0000
	Total	80	100	
liquid soap in a dispenser is available for use during hand washing	Never	15	18.8	2.3625
	Sometimes	21	26.3	
	Always	44	55.0	
	Total	80	100.0	
Alcohol based sanitizer is readily available for teachers and children for use during hand washing	Never	37	46.3	1.8125
	Sometimes	21	26.3	
	Always	22	27.5	
	Total	80	100.0	
Disposable tissues are available for wiping of hands after hand washing	Never	33	41.3	1.9875
	Sometimes	15	18.8	
	Always	32	40.0	
	Total	80	100.0	
Fabric towels are available for wiping hands after washing	Never	17	21.3	2.3750
	Sometimes	16	20.0	
	Always	47	58.8	
	Total	80	100.0	
Disposable tissues available for cleaning mucous nostrils of children	Never	5	6.3	2.5750
	Sometimes	24	30.0	
	Always	51	63.8	
	Total	80	100.0	

Different mops are available for cleaning the school kitchen, classroom floor and the toilet	Never	18	22.5	2.3375
	Sometimes	17	21.3	
	Always	45	56.3	
	Total	80	100.0	
More than one teacher is available in a classroom.	Never	22	27.5	2.2250
	Sometimes	18	22.5	
	Always	40	50.0	
	Total	80	100.0	
Available toilet for school children and teachers to use	Never	7	8.8	2.5750
	Sometimes	20	25.0	
	Always	53	66.3	
	Total	80	100.0	
Bleach is available for cleaning the toilet, bathroom and urinal	Never	2	2.5	2.75000
	Sometimes	16	20.0	
	Always	62	77.5	
	Total	80	100.0	
All classroom windows have mosquito proof net available	Never	49	61.3	1.7000
	Sometimes	6	7.5	
	Always	25	31.3	
	Total	80	100.0	
Dustbins in every class with well-covered lid are available for rubbish collection.	Never	18	22.5	2.3750
	Sometimes	14	17.5	
	Always	48	60.0	
	Total	80	100.0	
Clean drinking water is available for the children	Never	1	1.3	2.9125
	Sometimes	5	6.3	
	Always	74	92.5	
	Total	80	100.0	
Good ventilation available	Never	3	3.8	2.7500
	Sometimes	14	17.5	
	Always	63	78.8	
	Total	80	100.0	

Group mean of responses from teachers in private childhood education centres=2.445.

DISCUSSION

The results of the present study show that both the public and private educational centres had inadequate resources for infection prevention. That notwithstanding there was a statistically significant difference in resource availability to private teachers on infection prevention practice and public teachers. Similarly, there was a significant difference ($P=0.022$) when the impact of resource availability on the practice of infection prevention by the teachers was assessed between the two groups.

Serra in her study likewise Health Protection Agency recommends that staff and children wash their hands with liquid soap and running water then dry their hands using disposable paper towels, and to use alcohol gel hand sanitizer only if no water is available or after washing their hands with water.^{8,20} In the present study, liquid soap in dispenser availability for use during hand washing was inadequate for the two categories of teachers in the municipality. Instead, 69% of public teachers and 90% of the private teachers used a cake of soap in washing of hands as well as the school children. Disposable tissues were not available for wiping of hand

after washing neither fabric towels were available for wiping of hands after washing. The school children consequently shared communal towels after washing of hands. In addition, alcohol-based sanitizer was not readily available for teachers and school children for use during hand washing. The findings of the study is in accordance with an observational study on hand hygiene determinants that hand hygiene compliances cannot be effective without, number of sinks, type of towel soap facilities and availability of alcohol-based hand sanitizers.¹² Their observational study on hand hygiene compliance further included that the type of towel facilities was significantly associated with hand hygiene. The study concluded that education alone is insufficient to change behaviour however, other provisional enabling factors such (soap, soap dispensers, paper towels, paper towel dispensers and individual cups must augment change of behaviour.

Furthermore, a survey on availability of functional sinks in the classroom showed that none of the schools in the public as well private had a functional sink in the classroom however, running water in a form of veronica buckets was available for school children and teachers in some schools for use in washing of hands. Despite, CDC

regards the use of shared basins for handwashing as inadequate in ridding the hands of pathogens, 50% of public teachers and 70% of private teachers' response showed that source of water for washing of hands are available in basins.²¹ This is similar to the case in Ofankor (Ghana) where 15 schools out of 20 schools were found using shared basin while the other 5 schools were using functional hand washing stations with plastic/metal storage containers with taps and stand pipes.²² The activities of school children using shared basins and shared towels in washing of hands is to be discouraged as pathogen such as diarrhoea organisms are continually shared among the staff and the school children in a circular mode which may lead to the spread of diseases in the school.

In the public sector of childhood education programmes, most of the children admitted into school are 4 - 5 years of age. These children are no more in diapers and therefore diapering activities are not applicable to majority of the teachers that was evident in 53.8% of the response of the public teachers. However, children in the kindergarten once a while soil themselves with faeces. Few public centres in the municipality have started admitted babies and infants, unlike the private sector where children under 2 years are admitted. Only 12.5% of public teachers had designated area for changing of diaper as against 37.5% in the private schools. Majority

of the teachers did not practice good diapering hygiene, which is contrary to the standards of American Academy of Paediatrics.¹⁴ Changing of diapers according to the recommendations were to be performed in a designated area specifically diaper changing tables with large disposable tissues and separate from the children being handled. Thus, designated area should not be used for any other activities such as playing ground. In addition, used diapers are to be placed in leak proof bag or leak proof containers to prevent minimal contamination of bodily fluid to the environment of the children. The area is then cleaned with household bleach diluted with water after each use.²³ Considering the inadequate resources in both the urban and rural communities, providing a large disposal can add to the financial burden on parents and the schools, however, a mackintosh used and disinfected after each use can be financially moderate. The practice of using a diaper-changing table with large disposable tissues is feasible in the first class and internationally recognised early childhood educational centres. The study of diapering equipment designed to reduce the spread of infectious agents' was found to significantly reduced diarrheal illness among the children because of decreased illness among staff out-of-home in childcare centers.¹⁷ The impact of the equipment can therefore add value to the impact of training in proper diaper-changing and hand-washing that has been observed in previous studies (Table 3 and 4).¹⁷

Table 3: Resource availability on diaper changing area for public and private early childhood education centres.

Statements	Likert scale	No of public teachers	No of private teachers	% for public teachers	% for private teachers	Mode score for public teachers	Mode score for private teachers
Designated area available for changing of diaper	Never	17	37	21.3	46.3	4.00	1.00
	Sometimes	10	13	12.5	16.3		
	Always	10	30	12.5	37.5		
	Activity not applicable	43	---	53.8	----		
	Total	80	80	100.0	100.0		

Table 4: Classification of resources availability.

Mean rating	Interpretation
≤2.00	Non availability of resources
2.00-2.50	Inadequate resources
2.60-3.00	oderate availability of resources
3.10-3.50	Adequate resources
Above 3.60	Over resourced

In the rural community, 21.3% of the teachers in the public sector and 7.6% private teachers responded that children who soiled themselves with faeces and urine were not cleaned but rather had to go to their various homes for them to be cleaned up. This is because parents would not buy toiletries like soaps, detergents, antiseptic, and tissues unlike the urban centres that it is mandatory

for the parents to do so. The question is what happens to a child who is suffering from diarrhea and who goes from the house, meet absence of parents who have gone to the farm. It is obvious that, there would be leakage of faecal content along each path the child finds himself contributing to the spread of infection within the community.

Furthermore, the present study indicated that school children who come to the school without cups shares cups and water bottles with their friends. Other classrooms especially the public schools provided communal cups for children who did not come to school with their own cups. The practice of sharing cups is to be discouraged as most communicable diseases such as

measles and chickenpox can be found in oral secretions though some of the diseases are airborne.

Furthermore, child ratio to a toilet facility shows that more than 28 children use one toilet facility even though majority the teachers did not use toilet facility with the children but their own toilet facility. The practice of child to toilet ratio contradicts UNICEF ratio of 20 children per one toilet facility. AAP also recommends 10 children to one toilet facility that should be accompanied by hand washing facility.¹⁴ Early childhood centres attached to primary schools shared the same toilet facilities with the primary student because most of the childcare centres are attached to primary schools as well as junior high schools. Over 16.3% response from teachers indicated no toilet facility for the children to use. Instead, the children had to use public toilet used by the whole community. The findings of the study in similar in Kwabre District where as much as 15 out of the 30 schools had no toilet facilities. Pupils also used the toilet for the whole community. Among the 15 schools that had toilet facilities, only two kept this facility well maintained and clean. These schools had benefited from the Highly Indebted Poor Country (HIPC) initiative. The study further indicated the toilet facility was poorly maintained making it uncondusive to the health of the children.²³ Nevertheless, anecdotal evidence in Suhum Municipality shows that despite children being in public schools or private schools, it has become mandatory for parents to supply the wards with detergent, toilet rolls, bleach, and cakes of soap termly. Therefore, the use of sanitary materials should be available to all schools without excuse of unavailability of sanitary materials in keeping toilet and urinals clean. Although as already discussed, some parents would not buy sanitary materials for their wards to use.

With respect to infrastructure on the provision of mosquito net, 87.5% responses from public teachers as well as 61.3% responses from private teachers indicated all classroom windows did not have mosquito proof net available. The mosquito proof net did not only protect the children in the class from day time mosquito bites but also other insects such as flies from entering the class and to sieve dust coming from outside the environment. The practise of mosquito proof net is to be encouraged in schools since some established early childhood education centres is found in mosquito endemic areas.

Currently, the Ghana Education Service requires maximum number of children in a class to be 25. It is therefore alarming when almost 30% samples of classes within the public sector and private sector have children over 40 within the class and sometimes with only one teacher to take care of them. One would argue that, quality of care given to these children is compromise. DeSchipper *et al* identified that the strongest and most consistent predictor of observed positive caregiving in group-based early childhood settings is the adult: child ratio.²⁴ That is, caregivers provided more sensitive,

frequent and positive care when they were responsible for fewer children. There is also the need to consider the effect of elements of the physical environment of early childhood settings, as crowded settings can have on the health of infants and toddlers, such as ear infections stomach flus and other childhood illnesses.²⁵ In addition, large numbers of children and frequent close person-to-person contact facilitates the development and spread of resistant organisms in day care centres. Consequently, the spread of skin rashes like ringworm and scabies due to frequent contact are associated with large of children within a class.²⁶

Large numbers of children within a classroom of poor ventilation are also at risk of respiratory conditions such as frequent colds and influenza that could also lead to unnecessary prescription of antibiotics to school children. Researchers often identify correlations between large number of children in day care centers and children's likelihood of suffering from infectious illnesses because larger groups (group size) consist of more potential infectious agents.²⁷

CONCLUSION

The establishment of early childhood education centres in Ghana has now become an integral part of basic education for younger children. Despite the recent establishments of these learning centres, there is an increase in number annually. It is therefore obvious that, without the adequate and appropriate number of resources designed to control and prevent infection, the health of these children as well as staff will continually be in a state of concern.

The Ghana Education Service in conjunction with Ghana Environmental Protection Agency and Ministry of Health should make it mandatory for childcare providers to provide adequate resources such as good running water, appropriate toilet age facilities, well-covered dustbins and appropriate disinfectants before and during establishment of early childcare centre. In addition, effective supervision by public health officials such public health nurses, school nurses, environmental sanitation officers and the school health coordinator is to be encouraged to re-enforce attitudinal change in proprietors' of childcare settings.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Donkor S. Israel collaborates with Ghana to promote early childhood education. *Daily Graphic*; 2011: 12-3.
2. Ghana Ministry of Education. Education sector performance report. Retrieved from <https://s3.amazonaws.com/.../2010+Education+Sector+Performance+Rep>.

3. Sonoda C, Tagami A, Nagatomo D, Yamada S, Fuchiwaki R, Haruyama M, et al. Laboratory and epidemiology communications. An enterohemorrhagic *Escherichia coli* 026 outbreak at a nursery school in Miyazaki, Japan. *Infectious Agents Surveillance*. 2008;61:92-3.
4. Ramakrishnan K, Sparks RA, Berryhill WE. Diagnosis and Treatment of Otitis Media. *J Am Family Physician*. 2007;76(11).
5. Younus M, Wilkins MJ, Davies HD, Rahbar MH, Funk J, Nguyen C, Siddiqi A-E A, Cho S, Saeed M. Case-control study of disease determinants for non-typhoidal *Salmonella* infections among Michigan children. *Bio Medical Central Research Notes*. 2010;3:105-14.
6. Shope TR. Infectious Diseases in Early Education and Child Care Programs. *Pediatrics in Review*. 2014;5(35):182-93.
7. WHO. Guidelines on hand hygiene in health care. Geneva: World Health Organization; 2009. Available from: http://whqlibdoc.who.int/publications/2009/9789241597906_eng.pdf
8. Health Protection Agency. Guidance on infection control in schools and other childcare Settings. 2013. Retrieved from www.publichealth.hscni.net
9. World Health Organization. WHO Guidelines on Hand Hygiene in Health Care; First Global Patient Safety Challenge Clean Care is Safer Care .2015. Retrieved from whqlibdoc.who.int/publications/2009/9789241597906_eng.pdf
10. Correa JC, Pinto D, Salas LA, Camacho JC, Rondón M, Quintero J. A cluster-randomized controlled trial of hand rubs for prevention of infectious diseases among children in Colombia. *Pan Am J Public Health*. 2012;31(6):476-84.
11. Scott B, Curtis V, Rabie T, Garbrah-Aidoo N. Health in our hands, but not in our heads: understanding hygiene motivation in Ghana. *Health Policy Plan*. 2007;22(4):225-33.
12. Zomer TP, Erasmus V, van Beeck EF, Tjon-A-Tsien A, Jan Hendrik Richardus JH, Voeten HA. Hand hygiene compliance and environmental determinants in child day care centers: An observational study. *Am J Inf Control*. 2013;41(6):497-502.
13. Public Health Agency. Guidance on infection control in schools and other childcare settings. 2013. Retrieved from www.publichealth.hscni.net/sites/default/.../A2%20Schools%20poster
14. American Academy of Paediatrics. Caring for Our Children: National Health and Safety Performance Standards for out-Of- Home Child Care and Early Education Programs. 3rd ed. Elk Grove Village. IL; 2011. Retrieved from <http://cfoc.nrckids.org/>
15. National Health and Medical Research Council. Staying Healthy in Child Care – Preventing infectious diseases in childcare. 5th ed. Canberra ACT: Australian Government; 2012. Retrieved from http://www.nhmrc.gov.au/_files_nhmrc/file/publications/synopses/ch43.pdf
16. Health Protection Scotland. Infection Prevention and Control in Childcare Settings (Day Care and Childminding Settings). Glasgow: Health Protection Scotland; 2011. Retrieved from <http://www.documents.hps.scot.nhs.uk/hai/infection-control/guidelines/infection-prevention-control-child-care.pdf>
17. Kotch J, Isbell P, Weber D, Nguyen V, Savage, Gunn E, Skinner M, et al. Washing and Diapering Equipment Reduces Disease Among Children in Out-of-Home Child Care Centers. *J Am Association Pedeadtrics*. 2007;120(1): e29-36.
18. Enand WL, Gan GL. “Factors associated with use of improved water sources and Sanitation among rural primary schoolchildren in Pursat Province, Cambodia”. *Southeast Asian J Tropical Medicine and Public Health*. 2011;42(4):1022-31.
19. Joshi A, Amadi C. Impact of Water, Sanitation, and Hygiene Interventions on Improving Health Outcomes among School Children. *J Environmental Public Health*. 2013;(10).
20. Serra ME. Prevention of respiratory infections at day care centers: recommendations and systematic review of the evidence. *Arch Argent Pediatr*. 2014;112(4):323-31.
21. Centers for Disease Control. Hand-Washing Recommendations to Reduce Disease Transmission From Animals in Public Settings. *Morbidity and Mortality Weekly Report*. 56(RR05): 16-17; 2007. Retrieved from <http://www.cdc.gov/mmwr/preview/mmwrhtml/rr5605a4.htm>
22. Monney I, Dwumfour-Asare B, Owusu-Mensah I. A Study of Basic School Children in an Urban Community in Ghana. *Int J Innovative Research Development*. 2014;3(5):436-41.
23. Agana L. Bleach-free Disinfection and Sanitizing for Child Care. Bleach exposure in childcare settings. 2013. Retrieved from www.sfgov3.org/modules/showdocument.aspx?documentid=3822.
24. Boateng NAA. Assessing the Implementation and Practice of the School Health Program in Some Basic Schools in the Kwabre District. Master’s [thesis]. Kwame Nkrumah University of Science and Technology; 2008.
25. DeSchipper E, Rieksen-Walraven M, Guerts S. Effects of child-caregiver ratio on the interactions between caregivers and children in child care centers: An experimental study. *Child Development*. 2006;77:861-4.
26. Bedford M, Sutherland K. Early childhood education and care in New Zealand: Do we have a runaway train? The First Years Nga Tau Tuatahi. *NZ J Infant and Toddler Education*. 2008;10(1):38-42.
27. Greenberg D, Hoffman S, Leibovitz E, Dagan R. Acute otitis media in children: association with day care centers--antibacterial resistance, treatment, and prevention. *J Paediatric Drugs*. 2008;10(2):75-83.

Cite this article as: Siakwa M, Offe S. Resource availability for infection prevention in early childhood education centres from Southern Ghana. *Int J Community Med Public Health* 2016;3:3068-75.