Beni-Suef University Journal of Basic and Applied Sciences xxx (2017) xxx–xxx

Contents lists available at ScienceDirect

Beni-Suef University
Journal of Basic and Applied Sciences

journal homepage: www.elsevier.com/locate/bjbas

Full Length Article

Meta-analysis of staphylococcal diarrhea in some developing African countries

George P. Einstein [a,b], Orien L. Tulp [b], Temitope C. Oyesile [b], Olayide F. Obidi [c,*]

[a] Einstein Medical Institute, USA
[b] College of Medicine, USAT Montserrat, USA
[c] Department of Microbiology, University of Lagos, Nigeria

ARTICLE INFO

Article history:
Received 17 December 2016
Received in revised form 15 February 2017
Accepted 20 February 2017
Available online xxxx

Keywords:
Burden
Diarrhea
Hygiene
Staphylococcus aureus

ABSTRACT

Staphylococcal diarrhea is a common gastro-intestinal illness caused by poor water supply and unhygienic food preparation. Although, about 70% of diarrheal cases per year have been attributed to the consumption of contaminated foods, in Africa, few studies have reported the incidence of *Staphylococcus*-related diarrhea and the implicated virulence factors. We investigated the implications of common factors such as age of children, age of mothers, maternal level of education, gender of children, overall bacteria isolated, sanitary condition status and feeding type of mothers on the burden of staphylococcal diarrhea. A literature search was performed using Pubmed, Googlescholar, American society for microbiology (ASM) journals and other sources. The quality of studies was assessed. Adjusted odds ratios with 95% confidence intervals (CI) for the occurrence of *Staphylococcus aureus* amongst other causes were extracted. For each study, a multivariate logistic regression analysis of the adjusted odds ratio was performed to identify the risk factors on the burden of staphylococcal diarrhea. Six case-control studies were included in the meta–analysis. Quality of individual studies rages from 0.57–0.84 (median, 0.69). meta-analysis gave pooled odds ratios 3.27 (95% CI; 2.88–4.17). The results identified inadequate sanitary conditions and type of feeding as major risk factors.
© 2017 Beni-Suef University. Production and hosting by Elsevier B.V. This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

1. Introduction

The incidence of diarrhea- a gastrointestinal tract infection has remained a significant cause of mortality and morbidity amongst young children in Africa and has been implicated as part of the social problems in Nigeria and other developing countries in Africa (Okolo et al., 2013). The emergence of resistant strains has also helped to worsen the scenario. *S. aureus* is a major causative agent of acute and infectious diarrhea (Baba-Moussa et al., 2010) and is associated with three toxicoses namely, staphylococcal food poisoning, toxic shock syndrome and exfoliative dermatitis (Jones et al., 2002). Due to the increase in the level of diarrhea caused by *S. aureus* and β-lactamase-producing strains among children, it has become mandatory to carry out susceptibility tests prior to selection of antibiotics for use. Previous studies have confirmed that the rise in resistance by most clinical isolates of *S. aureus* to antibiotics represented a serious threat to health (Olukoya et al., 1995; Adeleke and Odelola, 2000). Olowe et al. (2003) estimated the diarrhea specific mortality in children under the age of five years in Africa to be about 106 per 1000. At the onset of staphylococcal food poisoning, symptoms manifested are usually rapid and in most cases acute, depending on factors such as the individual's susceptibility to the toxin, the quantity of contaminated food ingested, the amount of toxin in the food ingested and the overall health status of the patient (Lambrechts et al., 2014). Previous research has demonstrated that food poisoning caused by the catering industry is 70% higher than that caused by any other sector while improper food handling accounts for 97% of food borne illnesses (Abdalla et al., 2008b, 2009). *S. aureus* has been implicated in several food poisoning outbreaks which occur especially when food handlers carry an enterotoxin producing *S. aureus* that contaminate the food and cause *S. aureus* diarrhea (Gumbo et al., 2015). Hand washing with soap has been demonstrated as a fundamental precautionary measure to protect against the risk of staphylococcal diarrhea diseases (Chinakwe et al., 2012).

2. Methodology

2.1. Study population

A meta-analysis of six peer-reviewed researches carried out between 2007 and 2015 was performed at the Department of Microbiology, University of Lagos, Nigeria in March 2016. The

* Corresponding author.
E-mail address: laideob@yahoo.com (O.F. Obidi).

http://dx.doi.org/10.1016/j.bjbas.2017.02.004
2314-8535/© 2017 Beni-Suef University. Production and hosting by Elsevier B.V.
This is an open access article under the CC BY-NC-ND license (http://creativecommons.org/licenses/by-nc-nd/4.0/).

Please cite this article in press as: Einstein, G.P., et al. Meta-analysis of staphylococcal diarrhea in some developing African countries. Beni-Suef Univ. J. Basic Appl. Sci. (2017), http://dx.doi.org/10.1016/j.bjbas.2017.02.004

study population included two hundred and seventy one (271) mothers and one thousand, one hundred and sixty five (1165) children. The demographic characteristics of the mothers and their children were analysed and investigated with socio–economic, environmental and behavioural risk factors of diarrhea among the children. These variables include age of mothers, maternal level of education, age of children, gender of children, overall bacteria isolated, prevalence of staphylococcus diarrhea, sanitary condition status and feeding type of mothers. The subjects from this study originated from various social and ethnic groups as well as geographically distinct area from the territory of sub–Saharan African.

2.2. Data management and analysis

Data analyses were carried out with EPI–INFO version 3.5.1. Descriptive statistics such as means, medians, ranges and standard deviations were used to summarize quantitative variables such as patients' characteristics while categorical variables such as level of adherence were summarized with proportions and percentages. Bivariate analysis such as Chi–square test was used to investigate the factors associated with the selected variables. Logistic regression was further used to determine the factors that may be significantly associated with prevalence of staphylococcus Diarrhea. Model fit was assessed using the Hosmer Lemeshow goodness of fit test. All tests were carried out at 5% level of significance.

3. Results

Table 1 summarizes the socio–demographic characteristics of subjects from six peer–reviewed researches. The mean age was 23.7 ± 9.2 years. Majority of the mothers were between 16 and 24 years (41.3%). About 1.8% of them were above 60 years of age. More than a third of the respondent mothers (38.7%) had primary education. However, only 10.3% of them were exposed to tertiary education and 24.7% were complete illiterates, not being able to read or write.

Table 2 gives the result of the socio–demographic characteristics of the children (≤60 months). About one–third the children are between 7–12 months (34.5%) while those in the age bracket of 0–6 months were (15.9%). More than half of the children were Males (58.0%) and 42.0% were females.

Table 3 displays the distribution of bacteria isolated. Amongst all isolates, *Escherichia coli* was the most (61.2%) isolated bacteria while *Morganella morganii* was the least (1.0%) isolated bacteria. The percentage distribution of *S. aureus* was 5.6%. Table 4 shows that children less than 12 months reported the highest positives (20.8%) for diarrhea among the subjects examined while children between 13 and 24 months reported the least positives (3.9) among the subjects. In Table 5, it is obvious that more than three–quarters (78.9%) of the children developed staphylococcal diarrhea while 21.1% tested negative for staphylococcal diarrhea

Table 6 shows that less than a quarter (21.9%) were exposed to adequate sanitary condition while more than half of them (78.1%) were exposed to poor and inadequate sanitary conditions. In addition, more than a third of them (38.9%) were exposed to exclusive breast feeding by their mothers while 61.1% were not.

Table 7 displayed test of association between staphylococcal diarrhea status and its associated factors. There was a significant association in comparison of Staphylococcus Diarrhea Status with Age group of children ($P = 0.013$), Sanitary Condition ($P = 0.007$) and Feeding Type of Mothers ($P = 0.002$). However, there are significant association between Staphylococcal Diarrhea Status in comparison with Age group of Mothers ($P = 0.274$) and Maternal Level of Education ($P = 0.193$). The factors identified to be significantly associated with prevalence of Staphylococcus Diarrhea condition in bivariate analysis were harvested and subjected to multivariate analysis. Children who have inadequate sanitary conditions are five times more likely to (OR = 5.307, $P = 0.026$, 95% CI: 2.878, 9.613) have staphylococcal diarrhea condition than those who are exposed to adequate sanitary condition. Also, Children who are not exposed to exclusive feeding are two times more likely (OR = 2.214, $P = 0.033$, 95% CI: 1.774, 4.683) to develop staphylococcal diarrhea condition compared to those who are exposed to

Table 1
Socio–demographic characteristics of mothers.

Variable	Frequency	Percentage
Age group of mothers		
16–24	112	41.3
25–34	79	29.2
35–44	48	17.7
45–59	27	9.9
≥60	5	1.8
Total	271	100.0
Maternal level of education		
None	67	24.7
Primary	105	38.7
Secondary	71	26.2
Tertiary	28	10.3
Total	271	100.0

Table 2
Socio–demographic characteristics of the children (≤60 months).

Variable	Frequency	Percentage
Age group of children (≤60 months)		
0–6	186	15.9
7–12	402	34.5
13–24	309	26.5
25–36	117	10.0
37–48	58	5.0
49–60	93	7.9
Total	1165	100.0
Gender of children (≤60 months)		
Male	676	58.0
Female	489	42.0
Total	1165	100.0

Table 3
Distribution of overall bacteria isolated.

Species	Frequency	Percentage
Escherichia coli	522	61.2
Salmonella sp.	24	2.8
Klebsiella pneumonia	75	8.8
Staphylococcus aureus	48	5.6
Enterobacter sp.	18	2.1
Pseudomonas sp.	36	4.2
Shigella sp.	13	1.5
Proteus sp.	108	12.7
Morganella morganii	9	1.0
Total	853	100.0

Table 4
Age distribution of children with diarrhea.

Age distribution of children with Diarrhea	Number of sample examined	Positive	Percentage
0–12	101	84	20.8
13–24	48	16	3.9
25–36	87	22	5.5
37–48	107	33	8.2
49–60	60	43	10.7
Total	403	198	49.1

Please cite this article in press as: Einstein, G.P., et al. Meta-analysis of staphylococcal diarrhea in some developing African countries. Beni-Suef Univ. J. Basic Appl. Sci. (2017), http://dx.doi.org/10.1016/j.bjbas.2017.02.004

Download English Version:

https://daneshyari.com/en/article/7211496

Download Persian Version:

https://daneshyari.com/article/7211496

Daneshyari.com