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*Afr. J. Biomed. Res. Vol. 23 (January, 2020); 71- 75*

*Research Article*

## **Relationship Between Respiratory Symptoms and Quality of Life of Children With Cerebral Palsy**

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### **ABSTRACT**

Respiratory conditions are among the causes of morbidity and mortality in children with Cerebral Palsy (CP). Little attention is given to how respiratory symptoms could affect quality of life (QOL) of these children. This study examined relationship between respiratory symptoms and QOL of children with CP. A total of 95 children participated in this cross-sectional study. Respiratory symptoms and QOL were assessed using Respiratory Symptom Questionnaire and Paediatric QOL Questionnaires respectively. Data obtained were analysed with Spearman Rank Order Correlation and Chi-square analyses to find relationship between respiratory symptoms and QOL and the association between respiratory symptoms and different types of CP respectively. All statistics were performed using SPSS version 20 at 0.05<sub>α</sub> significance level. There were 57 (60%) male and 38 (40%) female participants with mean age of 2.76 ±2.0years. Fifty-six (55.8%) of the children have spastic hemiplegia, 32 (31.6%) spastic quadriplegia and 13 (12.6%) spastic diplegia. The common respiratory symptoms were phlegm production 44(46.3%), cough 38(40%), dyspnoea 22(23.2%) and wheezes 21(22.1%). Significant negative correlation was observed between cough and QOL ( $r=-0.234$ ,  $p=0.022$ ). Phlegm production was significantly associated with quadriplegic type of CP ( $p<0.05$ ). Respiratory symptoms are common among children with CP and they could deteriorate the children's QOL. Pulmonary physiotherapy should be incorporated into the routine rehabilitation of these children.

**Keywords:** *Respiratory symptoms, quality of life, children, cerebral palsy*

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*Received: June 2018; Accepted: May, 2019*

### **Abstracted by:**

*Bioline International, African Journals online (AJOL), Index Copernicus, African Index Medicus (WHO), Excerpta medica (EMBASE), CAB Abstracts, SCOPUS, Global Health Abstracts, Asian Science Index, Index Veterinarius*

### **INTRODUCTION**

Cerebral palsy (CP) is a common cause of physical disability among children (Kwon and Lee, 2015). It is due to a non-progressive lesion that occurred in the developing foetal or infant brain (Kirsten *et al*, 2014) causing abnormality of movement and posture that may be accompanied by comorbid impairments such as intellectual disability, sensory disorders, behavioural problems (Bax *et al*, 2005) and impaired respiratory function especially among children with spastic CP types (Kwon and Lee, 2015; Vianello *et al*, 2015). Adequate respiratory function is essential for preservation of cellular metabolism for maintenance of life. Studies have shown that children with CP present with impaired respiratory function associated with respiratory muscle paralysis, inefficient biomechanics of breathing structures and limited chest expansion (Seddon and Khan 2003). Impairment of respiratory function could play important role in influencing

the success of treatment and rehabilitation of children with CP and their life expectancy (Seddon and Khan 2003).

About 40% of children with spastic CP experience the impairments of respiratory function (McCarthy *et al*, 2002) and further 58% developed respiratory symptoms such as cough or wheeze (Reddihough *et al*, 2001). According to the finding of Kwon and Lee (2015), the degree of impairment of respiratory function could be related to the type of CP with children having spastic diplegia experiencing more impaired respiratory function than those with spastic hemiplegia. Respiratory impairment is also very common in children with spastic quadriplegic CP (Vianello *et al*, 2015).

Researches have shown that impairments of respiratory function are among the major causes of mortality and morbidity among children with CP (Strauss *et al*, 1999; Evans and Alberman 2002; Park *et al*, 2006). Children with CP present with several respiratory impairments ranging from blocked airway, aspiration, airway inflammation and lung

damage (Park *et al* 2006 in Kwon and Lee, 2015). These children also stand a risk of having recurrent pneumonia, atelectasis, bronchiectasis, sleep apnoea, chronic obstructive and restrictive lung diseases (Park *et al*, 2006). The symptoms of the respiratory impairments could include cough, snoring, wheezing, crackles and asthma episodes (Fitzgerald *et al*, 2009). Respiratory symptoms among children with CP are commonly seen in clinical practice but they are not well studied and recorded and their impact on quality of life is not given adequate attention by the therapists and other clinicians working with these children (Seddon *et al*, 2003; Fitzgerald *et al*, 2009). Thus, understanding the pattern of respiratory symptoms among children with CP will be beneficial for clinical assessment and therapeutic intervention (Kwon and Lee 2015).

Quality of life (QOL) has been defined by the World Health Organisation (WHO) as an 'individual's perception of their position in life in the context of the culture and value systems in which they live, and in relationship to their goals, expectations, standards and concerns' (WHO,1995). QOL assessment is required in the complete evaluation of the impact of any disease. It enables health professionals to provide a more comprehensive description of the course of a disease or the impact of its treatment (Badaru *et al*, 2015a). A study revealed that children with severe forms of CP experienced the most respiratory problems and had the lowest QOL (Liptak *et al*, 2001). In Nigeria, the QOL of children with CP has been shown to be poor which has direct relationship with the severity of their physical disability (Tella *et al*, 2011). It is important to note however that there is paucity of published studies to establish the possible linked between respiratory symptoms and QOL of Nigerian children who are suffering from CP. According to Badaru *et al* (2015b), QOL of patients may differ due to difference in the culture and value systems of their communities including the varying weather conditions they are being exposed to which are critical to the development some respiratory conditions. It is therefore important to study the relationship between respiratory symptoms and QOL of children with CP in a Nigerian City. Improvement in respiratory QOL is an important goal in the management of children with CP (Aran, 2010). Therefore, identifying the respiratory symptoms that could have influence on the QOL of children with CP may pave way for further improvement in the rehabilitation of this condition.

## MATERIALS AND METHODS

This study was a cross-sectional survey in which 97 children with CP were recruited from Aminu Kano Teaching Hospital and Hasiya Bayero Paediatrics Specialist Hospital, Kano using consecutive sampling technique. All demographic variables for the children were obtained and recorded. Only the biological parents of the children were recruited for the proxy report of the childrens QOL.

**Ethical Consideration:** This study was approved by the research and ethics committees of Aminu Kano Teaching Hospital (NHREC/21/08/2008/AKTH/EC/1740) and that of Kano State Ministry of Health (ref: MOH/off/797/T.I./111. dated 24<sup>th</sup> June 2016). Informed consent was sought and

obtained from the parents prior to the commencement of the study.

**Assessment of Respiratory Symptoms:** This was done using the modified version of American Thoracic Society Division of Lung Diseases (ATS-DLD-78) questionnaire. ATS-DLD-78 is reliable  $\alpha = 0.74$  (Nkosi & Voyi 2016) and valid instrument (Brodkin *et al*, 1993). It has been validated for the evaluation of the impact of respiratory symptoms in the general population (Abbasi *et al*, 2012) and among textile workers (Jamali *et al*, 2017). The questionnaire was researcher administered and the parents of the children were asked to reply to the questions contained in the questionnaire. In this study, was used for screening of respiratory symptoms among children with CP. The respiratory symptoms assessed were dyspnoea, cough, haemoptysis, phlegm production and chest pain. The occurrence of each of the respiratory symptom was rated 'yes' and if absent 'no'.

**Assessment of QOL:** This was assessed using paediatric QOL questionnaire (PedsQL). The parent report version of this questionnaire was used. The internal consistency of the parent report version of PedsQL ranges from  $\alpha=0.87$  (Bastiaansen *et al*, 2004) to  $\alpha = 0.88$  (Hartman *et al*, 2014). The Test-retest reliabilities for all the PedsQL questionnaires were greater than 0.70 (Petersen *et al*, 2009). All versions of the questionnaires for different paediatric age ranges were used. They are 0-12 months, 13-24 months, 2-4 years, 5-7 years and 8-12 years. PedsQL has four domains; physical functioning, emotional functioning, social functioning and school functioning. It was administered to the parents of the children and retrieved same day after completion. Responses of parents were rated on a scale of 0-4 (this gave the raw score). The raw scores were converted to a scale of 0-100 as follows:

- Score of 0 was converted to 100,
- Score of 1 was converted to 75,
- Score of 2 was converted to 50,
- Score of 3 was converted to 25 and
- Score of 4 was converted to 0.

The total scale score for each child was calculated as the sum of scores of all the converted scores divided by the number of the items answered in the whole questionnaire gave the total score for the child's QOL. For the purpose of conducting Chi-square test, the QOL scores have been dichotomised into  $\leq 50$  (poor QOL) and  $> 50$  (good QOL)

**Data Analysis Procedure:** Descriptive statistics of frequency and percentage was used to summarize the data. Inferential statistics of Spearman Rank Order Correlation was used to check the relationship between respiratory symptoms and QOL while Fisher's exact /Chi-square tests were used to check for association between type of CP and respiratory symptoms. All analyses were performed using statistical package for social sciences (SPSS) version 20.0 and alpha level set at 0.05.

## RESULTS

Ninety-five (95) children with CP participated in this study. Fifty seven (60%) were males while 38(40%) were females. Their mean was  $2.76 \pm 2.0$ years (range 1-10 years). Majority

of the children 84 (88.4%) were aged 1-5 years. There were 53(55.8%) hemiplegics, 30(31.6%) quadriplegics and 12(12.6%) diplegics. Pattern of symptoms of respiratory conditions observed among the children studied showed that phlegm 44(46.3%) was the most common respiratory symptom followed by cough 38(40%) and dyspnea 22(23.2%). Also, 3(3.2%) of them have been admitted to hospital on account of a respiratory problem as presented in Table 1.

**Table 1:**  
Pattern of Respiratory Symptoms among the Participants

Variable	n	Percent(%)
<b>Dyspnea</b>		
No	73	76.8
Yes	22	23.2
<b>Cough</b>		
No	57	60
Yes	38	40
<b>Haemoptysis</b>		
No	91	95.8
Yes	4	4.2
<b>Wheezes</b>		
No	74	77.9
Yes	21	22.1
<b>Phlegm</b>		
No	51	53.7
Yes	44	46.3
<b>Chest pain</b>		
No	92	96.8
Yes	3	3.2
<b>Diagnosis of respiratory condition</b>		
No	91	95.8
Yes	4	4.2
<b>Adm. for respiratory Condition</b>		
No	92	96.8
Yes	3	3.2

**Table 2**  
Pattern of Respiratory Symptoms in different types of CP

Variable	Hemiplegic (n=53)	Quadriplegic (n=30)	Diplegic (n=12)
	Yes n(%) No n(%)	Yes n(%) No n(%)	Yes n(%) No n(%)
<b>Dyspnea</b>	11(20.8)	9(30)	2(16.7)
	42(79.2)	21(70.0)	10(83.3)
<b>Cough</b>	14(26.4)	20(66.7)	4(33.3)
	39(73.6)	10(33.3)	8(66.7)
<b>Haemoptysis</b>	1(1.9)	3(10)	0(0)
	52(98.1)	27(90)	12(100)
<b>Wheezes</b>	9(17)	1(3.3)	1(8.3)
	44(83.0)	29(96.7)	11(91.7)
<b>Phlegm Production</b>	17(32.1)	22(73.3)	5(41.7)
	36(67.9)	8(26.7)	7(58.3)
<b>Chest pain</b>	1(1.9)	1(3.3)	1(8.3)
	52(98.1)	29(96.7)	11(91.7)

Distribution of respiratory symptoms in the different types of CP shows various patterns. Majority of the children having hemiplegic CP were reported to experienced phlegm production 17(32.1) and cough 14(26.4). In the same vein, most of the children with quadriplegic CP 22(73.3) had phlegm production followed by cough 20(66.7). However, children with quadriplegic CP type have the highest number 3(10%) of those with haemoptysis. Among the children with diplegic CP, the highest symptoms reported was also phlegm production 5(41.7) followed by cough 4(33.3) as presented in Table 2.

**Table 3.**  
Correlation between Respiratory Symptoms and QOL

Variable	Rho	P
Dyspnea	-0.12	0.26
Cough	-0.23	0.02*
Haemoptysis	-0.15	0.15
Wheezes	-0.14	0.17
Phl7egm production	-0.12	0.23
Chest pain	-0.04	0.73

\*significant at p<0.05; Rho=Rank order correlation

In this study, of the 95 children, 24 (25.3%) have poor QOL while 71(74.7%) have good QOL. Furthermore, respiratory symptoms such as dyspnea, cough, haemoptysis, wheeze, phlegm production and chest pain were all observed to have negative insignificant correlation with QOL(P>0.05). However, only cough was observed to have significant negative correlation with QOL (r=-0.234, p=0.022) as presented in Table 3. Finally, when the associated between association respiratory symptoms and type of CP was analysed with Chi-square and Fisher's exact tests, it was observation cough and phlegm production were respiratory symptoms that are significantly associated with children who had quadriplegic type of CP (p <0.05) as presented in Table 4.

**DISCUSSION**

This study assessed the relationship between respiratory symptoms and quality of life of children with cerebral palsy. The study observed that majority of the children with CP were aged 1-5 years which can be attributed to the fact that parents tend to be more concerned at the first sight of disability when children are younger and are likely to adhere strictly to regular hospital visits. Furthermore, the outcome of this study has indicated that respiratory symptoms such as phlegm, cough, dyspnoea and haemoptysis are commonly found among children with CP. The possible implication of this finding is that early detection and treatment of such symptoms is very necessary in order to avert the development of serious life threatening pulmonary complications that will reduced their life span. Inline with the finding of this study, Reddihough *et al.*, (2001) highlighted that majority of children with CP further developed respiratory symptoms such as cough or wheeze. Studies have shown that children with CP suffer severe clinical course of the respiratory complication due to oromotor impairment (Cass *et al.*, 2005; Jamroz *et al.*, 2011; Vianello *et al.*, 2015; Garuti *et al.* 2016).

**Table 4:**  
Association between Respiratory Symptoms and Type of CP

Variable	Response	Hemiplegia	Quadriplegia	Diplegia	X <sup>2</sup> /fisher exact	P-value
Dyspnea	Yes	11	9	2	1.18	0.58
	No	42	21	10		
	Total	53	30	12		
Cough	Yes	14	20	4	12.9	0.001*
	No	39	10	8		
	Total	53	30	12		
Haemoptysis	Yes	1	3	0	2.83	0.168
	No	52	27	12		
	Total	53	30	12		
Wheezes	Yes	9	11	1	5.24	0.072
	No	44	19	11		
	Total	53	30	12		
Phlegm	Yes	17	22	5	13.25	0.001*
	No	36	8	7		
	Total	53	30	12		
Chest pain	Yes	1	1	1	1.96	0.37
	No	52	29	11		
	Total	53	30	12		

\*significant at  $p < 0.05$

Respiratory exacerbation in children with CP were also reported to be associated with gastroesophageal reflux (Vianello *et al*, 2015) and dysphagia (Cass *et al*, 2005).

The pattern of respiratory symptoms in this study showed that children with quadriplegia have the highest percentage of all the respiratory symptoms, this implies that these children are at high risk of developing respiratory complications compared to those with hemiplegia and diplegia. This implies that children with spastic quadriplegia may require more frequent pulmonary evaluation and treatment than the children with other types of CP. Vianello *et al*, (2015) has also reported that quadriplegic CP is associated with severe respiratory complications. Furthermore, outcome of a study Kwon and Lee (2015) has pointed out that the level of respiratory impairment in children with CP was related to the type of CP (Kwon and Lee, 2015).

The children with CP in this were observed to have good QOL. This means that they enjoyed adequate physical, emotional, social and cognitive functioning as it was reported by their parents. The outcome of this study on QOL is contrary to the findings of other studies where they reported that most children with CP have impaired QOL (Liptak *et al*, 2001; Sandella *et al* 2011; Tella *et al*, 2011; Mohammed *et al* 2016). The possible reason for the high ratings of the children's QOL by the parents could be that since most of them were aged 1-5 years, the physical stress and emotional burden of providing care to those children may not be very overwhelming compared to if the children are older. A similar study found that QoL of children with CP was significantly influenced by their age and severity of their disability (Tella *et al*, 2011). In addition, the questionnaire used in this study was the parent-proxy form. This could pose a barrier to the response from parents as some parents might exaggerate their responses. Child report version of the questionnaire was not used because most children with CP in this study cannot answer the questions to an optimum level.

Weak negative relationships were observed between all the symptoms of respiratory conditions and the QOL of

children with CP. This implies that persistent respiratory symptoms tend to pose distress on its sufferers and may reduce their QOL. Liptak *et al*, (2001) found that children with severe CP types experienced more respiratory complications had lower QOL. Furthermore, this study observed that only cough was found to significantly negatively influenced the QOL of children with CP. The possible implication of this finding is that cough is the only likely symptom whose persistence is capable of deteriorating the the health and wellbeing of the children with CP. Studies have shown that persistent respiratory problems in children with CP is often complicated by severe thoracic deformity, impaired cough, and upper airway obstruction (Garuti *et al* 2016; Proesmans 2016).

This study observed that respiratory symptoms such as cough and phlegm production are significantly associated with quadriplegic type of CP. In addition, this study found that haemoptysis and wheezes were also observed being more common in children with quadriplegic type of CP. This is not surprising as studies have established that children with quadriplegic CP tend to have some form of thoracic abnormality as a result of deviation of the chest from normal, such as a low upper to lower chest wall diameter ratio which is suggested as one of the factors affecting respiratory function in these children. This makes them vulnerable to have respiratory complications (Park *et al*, 2006). Moreso, these children are known to be almost always in a recumbent position, and only sit up to take meals and immediately get back to lying position. This is likely to predispose them to having such respiratory symptoms like cough, phlegm production and even aspiration.

In conclusion, Respiratory symptoms particularly phlegm production, cough and dyspnea are common among most children with CP. These symptoms also negatively correlate with their QOL. Respiratory symptoms should always be assessed in children with CP. The management of children with CP should involve pulmonary physiotherapists in the planing and administration of effective rehabilitation programmes for these children so as to improve their QOL.

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