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ORIGINAL ARTICLE

การรายงานด้วยตนเองเกี่ยวกับผลกระทบของภาวะน้ำลายหยดต่อการมีปฏิสัมพันธ์ทางสังคมและความภาคภูมิใจในตนเองในเด็กสมองพิการ

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บทคัดย่อ

ภาวะน้ำลายหยดและปัจจัยอื่นๆ ที่เกี่ยวข้องสามารถส่งผลกระทบต่อเด็กสมองพิการและผู้ดูแล การศึกษาที่ผ่านมาใช้แบบสอบถามจากผู้ปกครองหรือผู้ดูแล เพื่ออธิบายผลกระทบของภาวะน้ำลายหยดในเด็กสมองพิการ ข้อมูลเกี่ยวกับความรุนแรงและผลกระทบของภาวะน้ำลายหยดที่รายงานโดยความคิดเห็นของเด็กยังมีจำกัด การศึกษาครั้งนี้จึงมีวัตถุประสงค์เพื่อ 1) รายงานระดับความรุนแรงและผลกระทบของภาวะน้ำลายหยดต่อปฏิสัมพันธ์ทางสังคมและความภาคภูมิใจในตนเองในเด็กสมองพิการ 2) ทดสอบความสัมพันธ์ระหว่างความรุนแรงของภาวะน้ำลายหยดและระดับความสามารถด้านการเคลื่อนไหวตามระบบจำแนก GMFCS และ 3) ทดสอบความสัมพันธ์ระหว่างความรุนแรงและผลกระทบของภาวะน้ำลายหยดที่รายงานโดยเด็กสมองพิการ การศึกษาเชิงพรรณนาทำในเด็กสมองพิการที่มีภาวะน้ำลายหยด ช่วงอายุ 7-18 ปี ที่โรงเรียนศรีสังวาลย์ขอนแก่นและโรงเรียนศรีสังวาลย์เชียงใหม่ ผู้วิจัยประเมินความรุนแรงของภาวะน้ำลายหยดโดยใช้วิธีการสังเกตและให้คะแนนความรุนแรงด้วยแบบประเมิน drooling quotient 5-minute (DQ5) เด็กสมองพิการรายงานผลกระทบของภาวะน้ำลายหยดโดยตอบแบบสอบถาม (ใช่/ไม่ใช่) และให้คะแนนระดับความพึงพอใจบนเส้นตรงที่มีความยาว 13.5 เซนติเมตร ความสัมพันธ์ระหว่างความรุนแรงของภาวะน้ำลายหยดและระดับความสามารถในการเคลื่อนไหวได้รับการวิเคราะห์ทางสถิติโดยใช้ Spearman's rank correlation coefficient ความสัมพันธ์ระหว่างผลกระทบของภาวะน้ำลายหยดต่อการมีปฏิสัมพันธ์ทางสังคมใช้ Chi-Square (x^2) และผลกระทบต่อความภาคภูมิใจในตนเองใช้ Spearman's rank correlation coefficient ตามลำดับ ผลการศึกษาพบว่า เด็กสมองพิการ 91 จาก 355 คน (ร้อยละ 26) มีภาวะน้ำลายหยด และจำนวน 65 จาก 91 คน (ร้อยละ 71.4) ของอาสาสมัครมีภาวะน้ำลายหยดในระดับรุนแรง ระดับความรุนแรงของภาวะน้ำลายหยดสัมพันธ์กับระดับ GMFCS อย่างมีนัยสำคัญทางสถิติ (r = 0.62, p = 0.001) มีเด็กสมองพิการที่มีภาวะน้ำลายหยด จำนวน 62 (ร้อยละ 68%) คนสามารถตอบแบบสอบถามเกี่ยวกับผลกระทบของภาวะน้ำลายหยดได้อย่างเข้าใจ ความรุนแรงของภาวะน้ำลายหยดสัมพันธ์อย่างมีนัยสำคัญทางสถิติกับผลกระทบของภาวะน้ำลายหยดต่อการมีปฏิสัมพันธ์ทางสังคมกับเพื่อน (x^2= 14.39, df = 1, p < 0.001) ผู้ใหญ่ (x^2= 24.31, df = 1, p < 0.001) และการมีคุณค่าในตนเอง (x^2= 20.89, df = 1, p < 0.001) แต่ไม่พบความสัมพันธ์อย่างมีนัยสำคัญทางสถิติระหว่างความรุนแรงของภาวะน้ำลายหยดและผลกระทบต่อความภาคภูมิใจในตนเอง การศึกษานี้สรุปว่า เด็กสมองพิการมีภาวะน้ำลายหยดและระดับความรุนแรงของภาวะนี้สัมพันธ์กับระดับความสามารถด้านการเคลื่อนไหว และผลกระทบต่อการมีปฏิสัมพันธ์ทางสังคม

คำสำคัญ: เด็กสมองพิการ, ภาวะน้ำลายหยด, ปฏิสัมพันธ์ทางสังคม, ความภาคภูมิใจในตนเอง

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ORIGINAL ARTICLE

Self-report of drooling impact on social-interaction and self-esteem in children with cerebral palsy

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Abstract

Drooling and associated factors can impact children with cerebral palsy (CP) and caregivers. Previous studies used proxy-report to describe the impact of drooling in children with CP. There is limited data on severity and impact of drooling reported by the children's perspective. The aims of this study were to 1) report severity of drooling and impact of drooling on social interaction and self-esteem in children with CP, 2) examine the relationship between severity of drooling and levels of Gross Motor Function Classification System (GMFCS) and 3) examine the relationship between severity of drooling and impact of drooling on social interaction and self-esteem using self-reports by children with CP. A cross-sectional descriptive study was conducted in children with CP who had drooling, aged from 7 to 18 years old, at the Sri Sangvalya Khon Kean School and Sri Sangvalya Chiang Mai School. We assessed the drooling condition using a direct observational method, and rated its severity with the drooling quotient 5-minutes scale (DQ5). The impact of drooling on social interaction and self-esteem were self-reported using a yes-no questionnaire and the level of satisfaction were marked on a 13.5-centimeter line. Correlation between severity of drooling and levels of GMFCS was analyzed using spearman's rank correlation coefficient, the relationship between the severity of drooling and impact on social interaction and self-esteem were analyzed using the Chi-Squared (x^2) and Spearman's rank correlation coefficient respectively. Results show that 91 of 355 (26%) children were reported with having drooling condition and 65 of 91 (71.4%) children had severe drooling condition. The severity of drooling was statistically related to the levels of GMFCS (r = 0.624, p = 0.001). There were 62 (68%) children with CP could answer questionnaire on impact of drooling, the result showed that the severity of drooling was significantly related to impact on social interaction regarding their relationship with friends (x^2= 14.39, df = 1, $p < 0.001$), with adults (x^2= 24.31, df = 1, $p < 0.001$), and their mental capability (x^2= 20.89, df = 1, $p < 0.001$). There was no statistically significant relationship between severity of drooling and impact on self-esteem. We concluded that children with CP show condition of drooling and its severity is significantly related to their gross motor functions and impact on social interaction.

Keywords: Cerebral palsy, Drooling, Social interaction, Self-esteem

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INTRODUCTION

Cerebral palsy (CP) has been defined by Rosenbaum et al. (2007) as a group of disorders of the development of movement and posture, and consequently activity limitations thereby causing from non-progressive lesions that occur in the developing fetal or infant brain.[1] Difficulties in posture control and gross and fine motor dysfunction are the core features of CP. Moreover, poor postural control, especially head, neck and trunk control, leads to deficits in fine motor skills such as eye-hand coordination, manipulation and/or oro-motor function.[2] Oro-motor dysfunction, one of the deficits associated with motor speech problems, results in difficulties with swallowing and chewing, and excessive drooling.[3] Drooling is defined as unintentional loss of saliva from the oral cavity[4] or involuntary spillage of saliva out of the mouth.[5,6]

The drooling problem is commonly seen in children with CP. This is confirmed by research evidences on prevalence of drooling in children with CP between 22% and 58%.[3,7,8] According to Tahmassebi and Curzon (2003), 58% of children with CP attending special schools had drooling, and 33% of these children had severe drooling.[7] Hegde et al. (2009) examined drooling in 113 children with CP; the results found that 48.7% of children had drooling, and 17.7% of them had severe drooling.[8] Consistently, Reid et al. (2012) found that 40.5% had drooling and 15% of them had severe drooling.[9]

Children with CP who drool may appear to have mechanical stimulation of the salivary glands. There are arguments for increased salivary flow in children with CP who drool as a result of hyperkinetic oral motor activity, or swallowing are difficult to perform for children with CP due to incomplete lip sealing, low suction pressure, and extended time between the suction and suction of food.[10] Abnormal oro-motor tone and poor voluntary control of the head, lips, tongue, and jaw may all interfere with the ability to swallow saliva.[9] In addition, Reid and colleagues examined clinical factors associated with drooling in children with CP aged 7-14 years. Drooling was significantly associated with epilepsy, intellectual disability, limited or no useful speech, Gross Motor Function Classification System (GMFCS) levels IV or V, inability to control head posture, the quadriplegic topographical pattern of motor impairment, anterior open bite, poor lip closure, eating difficulties and special education. Drooling in children with CP was commonly found in children with poor gross motor function and in those with more severe presentations of CP, including poor head control, difficulty with eating, and inability to sustain lip closure and high GMFCS levels (p<0.001 for each).[9] Previous study also revealed that the drooling problem is most common in children with spastic quadriplegia with GMFCS levels IV-V.[9] Severe drooling condition found in children with CP distribution of motor impairment, and for those functioning in GMFCS levels III to V was around 80%.[9] Furthermore, most children with CP who had III or higher on the GMFCS levels had oral motor dysfunction, such as tongue protrusion, malocclusion, reduced intraoral sensitivity, or reduced voluntary control of the movement of lips, tongue, and jaw.[9]

The high prevalence of drooling had a negative impact on quality of life of children and caregivers. Research evidences showed that the drooling problem led to children caring problem,

reducing their participation of children in everyday activities,[11] reducing quality of life or relationships with parents [12] and having problems with psychological adjustment.[13] Van der Burg et al. (2006) evaluated the impact of drooling in children with CP on economics consequent, social interaction and self-esteem using a proxy-report of parental perceptions of the impact of drooling on their children and families. Parents perceived the drooling as a major negative factor on the social interaction and self-esteem of their children. Children's playing limitation and social interaction with adults or their families were reported. Furthermore, the study suggested that negative results in social interaction at home or school and loss of self-esteem were caused by their child's drooling condition.[14, 15] In Thailand, Fusakul et al. (2005) studied the impacts of drooling on physical and psychosocial aspects of caregivers of children with CP. This study had 52 children with CP, aged 4-12 years using questionnaire with a 5-point Likert scale was used to indicate the degree of impact on physical and psychosocial aspects of caregivers on children form caregiver. They found that 96% of CP children with drooling had a bad breath problem and choking or severe coughing, while 48.1% of children had psychosocial impacts such as low self-confidence and anxiety. Moreover, 71.2% of caregivers reported inconvenience in caring and having a limitation of doing outdoor activities as the most common problems.[16]

Previous studies have used questionnaires to assess the impact of drooling in children with CP by proxy report: asking parents, caregivers or teachers. However, there is still limited data on the children's perspectives or self-report on the impact of drooling. In order to measure the impact of drooling using self-report, a child had sufficient social perspective to answer the questions. Normally, children at 7 years gradually develop social perspective skills that enable them to imagine what other people think and, in particular, what others think of them.[17] This current study therefore aimed to 1) report severity of drooling and impact of drooling on social interaction and self-esteem in children with CP, 2) examine the relationship between severity of drooling and levels of GMFCS and 3) examine the relationship between severity of drooling and impact of drooling on social interaction and self-esteem using self-reports by children with CP, aged 7 to 18 years old.

MATERIALS AND METHODS

Participants

This study was a cross-sectional descriptive design. Participants were purposive and convenient samples recruited from at Sri Sangvalya Khon Kean School, and Sri Sangvalya Chiang Mai School, Thailand. The inclusion criteria of children were: aged from 7 to 18 years old, confirmed as having a cerebral palsy condition by physical therapy assessment, having the presence of drooling, and being able to communicate and follow at least 1 step instructions in the measurement procedures. Definition of drooling used in this study refers to the presence of saliva beyond the lower lip margin or a string of saliva falling from the mouth.[18] The exclusion criteria were children who had inability to communicate, had no eye contact or no eye following, visual and or hearing impairments by observation, had history of intellectual disability and had an ulcer

of the soft tissue within the mouth. The study was approved by the Khon Kaen University Ethics Committee for Human Research (HE602266). Informed consent was signed by guardians for permission of each child to participate in the study before data collection. The children with CP were also asked to give their assent to participate in the study.

Instruments

A 5-minute Drooling Quotient Scale (DQ5)

DQ5 is a direct observational method to evaluate the severity of drooling. The assessment can be performed in a classroom and completed within 10 minutes. The 10-minute recording includes 5 minutes of doing activity ($DQ5^{A}$) and 5 minutes of rest ($DQ5^{R}$). During activity, the child performs an activity in the sitting position, such as having interaction in classroom, singing or playing. During rest, the child was listening to a story or watching television. The observations for the DQ5 must be performed under a standardized condition: at least one hour after meal time, in a sitting position and the mouth is empty and clean before the start of the observation and any saliva is wiped off the chin.[18] The results of measurement shows high reliability in both inter-rater and intra-rater tests. The inter-rater reliability between the assessors from the video assessments were 0.95 (95% CI 0.85 - 0.99) and intra-rater reliability from four assessors ranged from 0.86 - 0.95 (95% CI 0.86-0.99).[18] Scoring of the DQ5 during each 5-minute trial can be performed by giving 1 point for the presence of drooling and 0 point for an absence of new saliva during every interval of 15 seconds. The total scores are obtained by averaging the scores between $DQ5^{A}$ and $DQ5^{R}$ and the percentage of drooling is calculated.[18] The cut-off score of DQ5 was estimated depending on the individual meaning of 'constant drooling' or 'on-and-off drooling'. Children who had a higher score of drooling quotient over 18% were considered as having severe drooling. The intra-rater reliability of the observer in this study was tested with a 1-week interval using video recordings of five children with CP who had the presence of drooling. The value of $ICC_{(3, 1)}$ was 0.98 (95% CI = 0.88 - 0.98) for $DQ5^{A}$ and 0.99 (95% CI = 0.92 - 0.99) for $DQ5^{R}$.

Measure of impact of drooling on social interaction and self-esteem

The impact of drooling on social interaction and self-esteem were measured by directly asking for a response from the children and adolescents with CP who had drooling. The questionnaire used in this study was modified from Van der Burg et al. (2006) who offered a qualitative method to evaluate parental perceptions of the impact of drooling in children with CP.[15] The impact of drooling on the social interaction questionnaire consists of 3 yes/no questions items. Contents of the questionnaire are as follows: 1- Do you feel that friends and other people do not come to play with you or talk to you, or do they keep their distance? 2- Do you feel that teachers, caregivers or other familiar adults keep their distance? 3- Do you feel that teachers, caregivers or other adults underestimate your mental capability? If children answer yes, they need to answer whether those situations were related to drooling and the answer can be yes, no or not sure.

The questionnaire about impact of drooling on self-esteem consists of 4 questions items about the level of self-esteem which might be

influenced by the score for the satisfaction in life. Children with drooling also give their opinion regarding how they feel about drooling and their relationship with friends and other people. The contents of the questionnaire are as follows: 1- How much do you feel satisfied when you are with friends, teachers, caregivers, or other people? 2- How much do you feel satisfied about your general appearance? 3- How much do you feel satisfied about your relationship with your family? 4- How much do you feel satisfied with life in general? To answer each of these 4 questions, the children also need to answer to what extent drooling contributes to the level of their satisfaction.

Scoring of the level of satisfaction is obtained by measuring the position of the mark in centimeters from the left end of the scale from 0 to 13.5 cm. The lowest score is zero which means very dissatisfied, while, the highest score at 13.5 cm. means the child is very satisfied. The measure of drooling contributing to level of satisfaction is scored by marking on a 13.5 cm. line. The lowest score at zero means drooling has no influence on the level of satisfaction, while the highest score at 13.5 cm. means drooling has a high influence on the level of satisfaction.[15]

Procedure

The data were collected from November 2017 to March 2018. The researcher asked for formal permission from the directors of the schools for data collection. Teachers or physical therapists at the school were contacted for arrangement about data collection; surveying the number of children with CP who had drooling and screening according to the criteria.

Participants' demographic data, such as age, sex, problems with communication and perception, underlying diseases, and treatments for drooling and eating conditions, were collected from the participants' history-record files at the school. Participants were classified their cerebral palsy subtype, topographical pattern and levels of GMFCS. Oral sensation impairment and lip closure ability were assessed by researcher.

Before collecting data, the researcher became familiar with the children by doing activities with them in the classroom. Each participant was observed while doing class activity in order to assess the severity of drooling without being separated from peers, teachers and caregivers. During rest, children were asked to watch television in a sitting position and their severity of drooling were observed using the drooling quotient 5-minutes of rest ($DQ5^R$). Researcher observed the drooling condition by sitting close to children without their awareness. Each test was performed for 2 trials subsequently. The values of $DQ5^A$ and $DQ5^R$ were then averaged and calculated in percentage. After that, researchers asked participants questions using the questionnaire regarding the impact of drooling on social interaction and self-esteem. It took 10 minutes to finish the questionnaire.

Statistical analysis

Descriptive statistics was used to describe characteristics of participants, and the severity and impact of drooling. Correlation between severity and levels of GMFCS were analyzed using spearman's rank correlation coefficient. The relationship between the severity of drooling and the impact of drooling on social interaction were analyzed using the Chi-Squared test (cross tabulation), while the relationship between the severity of drooling and the impact of drooling on self-esteem was analyzed using Spearman's rank correlation coefficient due to a lack of normal

distribution for data. All analyses were performed using SPSS version 17.0 for Windows.

RESULTS

There were 355 students with CP from both schools. Ninety-one children with a drooling condition were recruited. The mean ± SD age of participants was 12 years 7 months ± 3 years 6 months and 62% of them were male. Only 62 of 91 (68%) drooling children could understandably answer questionnaires about the impact of drooling. The characteristics of all participants are presented in **Table 1**.The severity of drooling was related to the level of GMFCS (r = 0.624, p = 0.001).

Table 2 shows drooling impact on the social interaction. **Table 3** shows impact of drooling on self-esteem. Apparently, the scores for satisfaction were ranged from 1.5 to 2.9 on the 13.5 cm. line, while the relevance between levels of satisfaction in daily life situation and drooling were ranged from 10.8 to 12.1 on the 13.5 cm. line.

Table 1 Characteristics of all participants with drooling (n = 91)

Characteristic	n	%
Severity of drooling		
Children with drooling (DQ5 < 18%)	26	28.6
Children with severe drooling (DQ5 ≥ 18%)	65	71.4
Sex		
Male	56	62
Female	35	38
Cerebral palsy subtype		
Spastic		
- Unilateral	16	18
- Bilateral	50	55
Athetoid	16	18
Ataxia	5	5
Mixed	4	4
GMFCS levels		
I	5	6
II	34	37
III	46	50
IV	6	7

Table 1 Characteristics of all participants with drooling (n = 91)

Characteristic	n	%
Problem with communication and perception		
Yes	29	32
No	62	68
Underlying diseases		
Yes		
- Epilepsy	17	19
- Asthma	3	3
- Heart disease	2	2
No	69	76
Oral sensation impairment		
Intact (≥3/5)	55	60
Impaired (<3/5)	36	40
Used to obtain treatment		
Yes		
- Massage	22	30
- Swallowing	19	21
- Speech therapy	17	19
- Jaw control	2	2
No	31	28
Eating condition		
Independently by themselves	84	92
Requiring assistance from a caregiver	7	8
Lip closure ability		
Yes	66	73
No	25	27

Table 2 The impact of drooling on social interaction *(n = 62)*

Question		n, (%)			
		Yes			No
		Ask if answer yes			
			Yes	No	Not sure
Q. 1	Do you feel that friends and other people do not come to play, talk to you or keep their distance?	56, (90)			6, (10)
	Because you have drooling?		50, (89)	1, (2)	5, (9)
Q. 2	Do you feel that teachers, caregivers or other familiar adults keep their distance?	54, (87)			8, (13)
	Because you have drooling?		47, (87)	0, (0)	7, (13)
Q. 3	Do you feel that teachers, caregivers or other adults underestimate your mental capability?	55, (88)			7, (12)
	Because you have drooling?		49, (89)	1, (2)	5, (9)

The severity of drooling was significantly related to the impact on socialinteraction in children regarding their relationship with friends (x^2= 14.39, df = 1, $p < 0.001$), adults (x^2= 24.314, df = 1, $p < 0.001$) and their mental capability (x^2= 20.888, df = 1, $p < 0.001$).

Table 3 The impact of drooling on self-esteem (n = 62)

	Questions	Level of self-esteem (0-13.5 cm.)	
		Mean ± SD	Range
Q. 1	How much do you feel satisfied when you are with friends, teachers, caregivers or other people?	2.7 ± 4.1	0.1 - 12.8
	How much is the level of your satisfaction related to drooling?	10.9 ± 4.3	0.2 - 13.4
Q. 2	How much do you feel satisfied about your general appearance?	1.8 ± 2.6	0.1 - 12.2
	How much is the level of your satisfaction related to drooling?	11.9 ± 2.5	1.3 - 13.4
Q. 3	How much do you feel satisfied about your relationship with your family?	2.9 ± 3.9	0.2 - 13.0
	How much is the level of your satisfaction related to drooling?	10.8 ± 4.1	0.3 - 13.4
Q. 4	How much do you feel satisfied with life in general?	1.5 ± 2.1	0.2 - 12.5
	How much is the level of your satisfaction related to drooling?	12.1 ± 2.1	0.8 - 13.5

There was no statistically significant relationship between severity of drooling and impact on self-esteem with friends, teachers (r = -0.12, p = 0.388), general appearance (r = -0.15, p = 0.254), family (r = -0.12, p = 0.328) and life in general (r = -0.10, p = 0.434).

DISCUSSION

This cross-sectional study was to report severity of drooling and self-report on the impact of drooling in children with CP on social interaction and self-esteem. We also tested the relationship between severity of drooling and levels of GMFCS and impact of drooling in these children. Results of this study showed that 91 of 355 (26%) participants had drooling, 65 of 91 (71.4%) children had severe drooling condition (DQ5 ≥ 18%). Erasmus et al., (2009) suggest that the highest severity of drooling was reported in CP children with severe involvement of all four limbs, no independent ambulation, poor oro-motor function, and poor head neck and trunk control. This previous study provided evidence that

drooling were all more common in higher GMFCS levels.[10] Cerebral palsy children with severe gross motor function are more likely to develop drooling due to their more extensive brain dysfunction and poor oral motor and sensory function compared with other types of CP.[19] The high percent of severity could be attributed to motor impairment since we found significant relation between the severity of drooling and levels of GMFCS (r = 0.624, p = 0.001). This significant correlation confirmed previous studies.[7,8,9] Reid et al. (2012) found 80% of CP children with drooling were classified as GMFCS levels III to V.[9] Furthermore, Parkes et al. (2010) reported that excessive drooling was significantly related to GMFCS and the risk was greatest among children with GMFCS levels IV (OR 4.8) and V (OR 12.9) compared with those with GMFCS level I.[3]

Furthermore, our study found that 40% of children who have severe drooling had impaired oral-sensation, and 27% showed loss of lip closure ability. These results are supported by Ray et al. (2012) and Iammatteo et al. (1990) who found a significant negative correlation between the ability to maintain mouth closure and the severity of drooling (r = -0.244, $p < 0.001$).[9, 21] This correlation was significant but quite low, so researchers gave suggestion that the severity of drooling may decrease as the participants gained control of mouth closure.[20,21] Thamassebi and Luther (2004) also found a significantly greater number of CP children who drooled had incompetent lips, compared with those without drooling ($p < 0.002$).[22] Moreover, Weiss-Lambrou et al. examined the relationships between oral sensations and drooling in 40 persons with CP aged between 5 and 21 years. They found that persons with CP who have a drooling problem obtain significantly lower scores on tests of oral sensation, compared with CP persons who do not have drooling problems (F = 10.46, $p < 0.001$).[23] Burgmayer and Jung suggested that drooling may result from an insufficient correlation between the sensations that arise when the saliva spills and the swallowing process. In the development of normal saliva control, the sensation caused by saliva running down the lower lips or chin probably causes an aversive sensation, and the swallowing of saliva becomes an avoidance behavior.[24]

This is the first study to examine self-report of the impact of drooling on social interaction and self-esteem. Van der Burg et al. (2006) studied the impact of drooling using a questionnaire about parental perception, suggesting that parental judgment on this issue, however, might not be sufficient to fully evaluate the impact of drooling. Possibly an additional judgment by the child would give a more realistic impression of social interaction.[14] Approximately 90% of students answered that drooling had an impact on their social interaction **(Table 2)** which was in agreement with parental judgment on this issue from the previous study.[14] Moreover, our results indicate that severity of drooling is significantly related to the impact on social interaction in children with CP. Children's perception from our study states that drooling is dirty, leads to a bad smell and damaged clothes, furniture, books and toys. A previous study also reported the inconvenience in caring and limitations in doing outdoor activities as the most common problem for CP children with drooling.[16]

Although, there was no statistically significant relationship between severity and self-esteem, the impact of drooling on self-esteem had scores on levels of satisfaction ranged from 1.5 cm. to 2.9 cm. and these scores were relevant to drooling ranging from 10.8 cm. to 12.1cm. This interesting in point may imply that drooling had an impact on self-esteem from children' perspective. The lack of statistical significance may be due to a limitation of wide range of subjective scoring on the 13.5 cm. line or the scales of severity and satisfaction were measuring in different dimensions. Our study measured the severity of drooling by observation, but marking on a 13.5 cm line for their satisfaction was performed using a subjective feeling of participants depending on their perception.

Nevertheless, a minority of children (approximately 10%) did not think that drooling leads to negative impact on social-interaction. Children in this study attended special schools for handicapped children; their teachers, caregivers and friends interacted positively with these children. This may also explain why some drooling children expressed positive feelings about their physical appearance, their competence, their social acceptance by adults and peers and why they express few negative effects of drooling. Some children with CP did not think that drooling had impact on social interaction because their friends and other people didn't keep distance and still play and talk with them normally and also kindly told them to clean up.

Although this study was designed to present children perspective, the study contains some limitations. First, the descriptive study was performed only in students with CP in special education schools with GMFCS levels I to IV, while most children with GMFCS level V cannot come to these schools. Secondly, not all children could answer the questionnaires regarding the impact of drooling on social interaction and self-esteem. The results of this study cannot be generalized for all CP children in a community or those who cannot come to school. A further study is needed in those living in the community or at their homes which might include all levels of GMFCS.

CONCLUSION

The results of the present study confirm previous studies and raise new data regarding the impact of drooling on social interaction and self-esteem from the children's perspective. Children with CP had drooling condition, and the severity of drooling was related to the levels of gross motor function and impact on social interaction. This information can be useful for health professionals, multidisciplinary teams and caregivers to realize the importance of treatment of drooling and to plan optimal rehabilitation for children with CP who have drooling condition.

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