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Primary school teachers' asthma knowledge and confidence in managing children with asthma

In Australia, one in six children has asthma with higher prevalence in the school aged group (The Asthma Foundation of Australia, 2007). The effect of asthma on children's quality of life particularly school attendance and performance is well documented (Braman, 2006; Lenney, 1997; Mutius, 2000; Woolcock et al., 2001). These facts impose on school teachers the necessity to support and manage these children in their classroom. For teachers to provide appropriate care, it is important that they have a sound knowledge of asthma and have the confidence to manage any problems that may arise. A recent study suggested asthma knowledge deficit among 34 elementary school teachers in a rural Illinois, USA, though found that teachers with an increased exposure/experience with asthma scored significantly higher than did those with limited exposure (Lucas at al., 2012). Many of the studies emerged in the '90s suggested a lack of teachers' awareness on asthma and its management (Madsen et al., 1992; Eisenberg et al., 1998; Hussey et al., 1999; Brookes and Jones, 1992; Bevis and Taylor, 1990). Teachers' training on asthma and its management was then recommended. French and Carroll (1997) conducted a study in Western Australia and found that while teachers were active in assisting children with asthma management, they had poor knowledge of asthma management and medications. These findings paralleled with the emergence of public health programs including health promotion and education programs. The aim of these programs was to improve the ability of schools and teachers to manage children with asthma. As part of a larger evaluation study of the Asthma Friendly Schools Program, this paper examined school teachers' knowledge of asthma and their confidence in managing children with asthma.

Methods

A convenience sample of 38 public and private primary schools in the Gippsland region of Victoria was invited to participate in the study, of which 16 schools agreed. All 255 teachers from the 16 primary schools (excluding support staff) were invited to participate in the study, of which 122 agreed, giving a response rate of 48%. Two measures were obtained: asthma knowledge and confidence in managing children with asthma.

Tools

A modified version of the Newcastle Asthma Knowledge Questionnaire developed by Fitzclarence and Henry (1990) was used for the purpose of the current study. The Newcastle Asthma Knowledge Questionnaire is a 31 item test (25 true/false items and six open ended questions) that provides a comprehensive assessment of key dimensions of asthma knowledge including: general facts about asthma, triggers, symptoms, and asthma treatment and management. The instrument has been used extensively in previous studies that included adults with and without asthma (Allen et al., 2000), child care staff (Hazell et al., 2006), asthma educators (Allen et al., 2000), teachers (Gibson et al., 1995; Henry et al., 2004) and parents of children with asthma (Fall et al., 1998; Ho et al., 2003; Khan, 2003). The psychometric properties of the Newcastle Asthma Knowledge Questionnaire are well established, with evidence of construct and discriminate validity, high internal consistency of items and test-retest reliability (Fitzclarence and Henry 1990; Wells,

2000). For the purpose of the current study, the original version of the Newcastle Questionnaire was modified to fit a true/false format. This included replacing four of the six open-ended questions with items from asthma knowledge measures reported by Martinez and Sossa (2005) and Bahari Ab Rahman (2003). The modified version included 29 true/false items and one open ended question that asked teachers to list three symptoms of asthma. Correct responses to each item are summed to provide a total asthma knowledge score, giving a maximum test score of 32.

A literature search failed to locate studies that measured teachers' confidence in managing asthma. Only two relevant instruments were located; the first was the single-item scale used by Shah et al. (1994) to assess the self-efficacy (confidence) of primary school teachers in managing students with asthma. The main limitation with this scale is that it provides a general measure of confidence, as distinct from how confident the teacher is in handling a range of situations. The second instrument, although not specific for teachers, was the multi-item scale developed by Mesters et al. (1993) to assess parents' self-efficacy in managing their child's asthma. This scale included 32 items that measured parent's opinion on how well they dealt with specific aspects of their child's asthma (medications, treating an asthma attack, assessing symptom severity, identifying asthma triggers). This instrument was considered to be too specific for use in the current study. Based on the previous literature search, a nine-item scale was designed specifically for this study to measure teachers' confidence in managing students with asthma in a variety of situations (e.g. taking a student with asthma on a school camp). The last item on the scale assessed the teacher's overall confidence in managing children with asthma. Teachers were asked to indicate their level of confidence on each item by placing an X mark on a 10 centimetre visual analogue rating scale that ranged from 0 (not at all confident) to 100 (completely confident).

Procedure

Approval to conduct the study was obtained from Monash University Human Ethics Committee and the Office for Policy Research and Innovation in the Department of Education and Early Childhood Development in Victoria. The schools that agreed to participate were visited and their role was discussed. Letters were posted to all teachers in each primary school through the internal mail system by staff in the school office inviting them to participate in the study. Letters included a plain language statement detailing the purpose of the study and what it entailed, and provided assurances that participation is voluntary and participants' identity shall remain anonymous. Attached with the letters were the Adult Asthma Knowledge Test and the Confidence in Managing Children with Asthma scale which take approximately 20 minutes to complete. Return of completed forms to the researcher in the pre-paid envelope provided was taken as their consent to participate. Data were cleaned and entered into SPSS 17.0 (SPSS Inc., Chicago, IL, USA) for analyses. Scores of both scales were plotted and approximated the normal distribution hence parametric analyses were applied.

Results

Sample characteristics

At least one school from each of the six Gippsland shires participated in the study. The majority of participating schools were public (n=12) with 11 schools that had a student population of over 100 children. Table 1 presents a summary of the characteristics of the 122 primary school teachers that participated in the study. The age of teachers ranged between 22 and 65 years ($\bar{x}$=44.3) with the majority being female (80.3%). Nineteen percent of teachers had asthma and 37% reported a family history of asthma.

Table 1: Teachers' characteristics (N=122)

Characteristics	Category	N	%
Gender	Male	24	19.7
	Female	98	80.3
Asthma diagnosis	Yes	23	18.9
	No	99	81.1
Family history of asthma	Yes	45	36.9
	No	77	63.1

Asthma knowledge

Table 2 (below - column 2) shows the percentage of correct answers for each item given by teachers on the Adult Asthma Knowledge test. The percentage of correct responses varied from 37.2 to 100. Fourteen

items were answered correctly by more than 90%, of which one item was answered correctly by all participants: item 25 (true to "Parental smoking may make the child's asthma worse"). Two items were answered correctly by less than 50% of the sample: item 22 (true to "When a child has an asthma attack it's best to go to the emergency room even if symptoms are mild") and item 28 (true to "Asthma is usually more of a problem at night than during the day"). Sixty four percent of teachers listed three correct symptoms of asthma for item 1. The mean knowledge score on the full test was 26.3 (SD = 2.6, Range 18 to 31). The reliability of the scale was determined by calculating internal consistency reliability coefficients using Kuder-Richardson 21 (KR-21) formulae. The analysis revealed a moderate reliability (0.50) for the asthma knowledge questionnaire.

Factors influencing asthma knowledge of teachers

Separate analyses were undertaken to examine the extent to which selected factors influence asthma knowledge of school teachers. One-way ANOVA and Student's t tests were used to compare teachers' asthma knowledge scores by school type, age, gender, asthma diagnosis and family history of asthma. Analysis of mean differences for each comparison group found none of these factors had a significant effect on the asthma knowledge of teachers. See Table 3 for a summary of the results.

Table 3: Teachers' asthma knowledge by comparison groups (N=122)

Group		**N**	**Mean (SD)**	*t*	*F*
School type	Public	83	26.4 (2.5)	0.70 ns	
	Private	39	26.0 (2.7)		
Age	<30	20	26.1 (2.6)		
	30-39	14	25.4 (2.9)		0.99
	40-49	36	26.7 (2.5)	ns	
	≥50	52	26.3 (2.5)		
Gender	Male	24	26.6 (2.5)	0.77 ns	
	Female	98	26.2 (2.6)		
Asthma diagnosis	Yes	23	25.9 (3.3)	-0.66 ns	
	No	99	26.4 (2.4)		
Family History	Yes	45	26.6 (2.8)	1.20 ns	
	No	77	26.1 (2.4)		

ns = not significant

Confidence in managing children with asthma

All 122 teachers who completed the knowledge questionnaire completed the confidence scale.

Table 2: Percentage of correct answers and mean total score by teachers on the adult knowledge test (N=122)

Item (A = Answer)		% correct
1. What are 3 main symptoms of asthma?	None correct	01.6
eg. Coughing, especially at night	One correct	08.2
Wheezing	Two correct	26.2
Shortness of breath	Three correct	63.9
2. More than 1 in 10 children will have asthma at some time during their childhood. (A = True)		92.6
3. Children with asthma have abnormally sensitive air passages in their lung. (A = True)		82.6
4. If one child in a family has asthma then all his/her brothers and sisters are almost certain to have asthma as well. (A = False)		98.4
5. Most children with asthma have an increase in mucus when they drink cow's milk. (A = False)		65.3
6. Influenza is a common cause or trigger of an asthma attack. (A = True)		65.6
7. During an attack of asthma the wheeze may be due to muscles tightening in the wall of the air passages in the lungs. (A = True)		85.8
8. During an attack of asthma, wheeze may due to swelling in the lining of the air passage in the lung. (A = True)		85.6
9. Asthma damages the heart. (A = False)		82.2
10. Asthma attacks can be prevented if medications are taken even when there are no symptoms between attacks. (A = True)		86.7
11. Ventolin inhaler is effective during attack. (A = True)		95.9
12. Antibiotics are an important part of treatment for most children with asthma. (A = False)		91.5
13. Most children with asthma should not eat dairy products. (A = False)		85.6
14. Allergy injections cure asthma. (A = False)		95.0
15. If a person dies from an asthma attack, this usually means that the final attack must have begun so quickly that there was no time to start any treatment. (A = False)		74.1
16. People with asthma usually have "nervous problems". (A = False)		96.7
17. Asthma is infectious (i.e. you can catch it from another person). (A = False)		99.2
18. Inhaled medications for asthma (e.g. Ventolin puffers, rotacaps) have fewer side effects than tablets. (A = True)		58.8
19. Short courses of oral steroids (such as prednisolone) usually cause significant side effects. (A = False)		70.2
20. Some asthma treatments (such as Ventolin) damage the heart. (A = False)		90.5
21. It is better to use inhalers directly, without a holding chamber, so the medication can go more directly to the lungs. (A = False)		87.5
22. When a child has an asthma attack it's best to go to the emergency room even if symptoms are mild. (A = True)		37.2
23. Children with asthma become addicted to their asthma drugs. (A = False)		98.3
24. Swimming is the only suitable exercise for asthmatics. (A = False)		98.3
25. Parental smoking may make the child's asthma worse. (A = True)		100
26. With appropriate treatment most children with asthma should lead a normal life with no restrictions on activity. (A = True)		98.4
27. The best way to measure the severity of a child's asthma is for the doctor to listen to the child's chest. (A = False)		64.7
28. Asthma is usually more of a problem at night than during the day. (A = True)		44.5
29. Most children with asthma will have stunted growth. (A = False)		98.3
30. Children with frequent asthma should have preventive drugs. (A = True)		90.9

Total Knowledge Score: Mean = 26.3 SD = 2.6 Range = 18-31

Table 4 presents the mean confidence rating for each item of the scale, along with the mean total scale score. Mean item scores ranged from 54.9 for item 5 ("Handling an asthma attack rather than taking the student to hospital") to 80.8 for item 2 ("Helping a student use their inhaler during an asthma attack"). The sample had a mean total confidence score of 70.6 (SD=18.5, Range 17 to 100). The internal consistency reliability of the scale was determined by calculating Cronbach's alpha. The analysis revealed high reliability coefficient for the teacher confidence scale (0.93).

Table 4: Teacher ratings on confidence in managing children with asthma (N=122)

Item	Mean
1 Taking a student on a school camp or excursion	80.0
2 Helping a student use their inhaler during an asthma attack	80.8
3 Calming a student when they have difficulty breathing	78.4
4 Keeping asthma from getting worse when the student starts to wheeze or cough	68.3
5 Handling an asthma attack rather than taking the student to hospital	54.9
6 Giving the appropriate medications to the student during an asthma attack	69.6
7 Knowing when the student requires medical assistance	66.1
8 Helping a student avoid things they are allergic to	66.8
9 Your overall confidence in managing children with asthma	69.6

Total Confidence Score: Mean = 70.6 SD = 18.5 Range = 17-100

Factors influencing teachers' confidence in managing asthma

Teachers' confidence in managing children with asthma was examined in relation to teachers' gender, if they had asthma or a family history of asthma. The finding from the analyses (Table 5) identified a significant effect on two of the three factors. Teachers who had asthma and reported a family history of asthma rated their confidence in managing children with asthma higher than teachers who did not have asthma or a family history of asthma. Although male teachers recorded a higher confidence rating than female teachers, the difference between the two groups was not statistically significant.

Table 5: Teacher confidence by comparison groups (N=122)

Group		N	Mean (*SD*)	*t*
Gender	Male	24	75.3 (18.5)	1.40
	Female	98	69.4 (18.5)	
Diagnosis	Asthma	23	79.3 (13.7)	2.60*
	Non-asthma	99	68.5 (19.0)	
Family History	Yes	45	75 (14.0)	2.04*
	No	77	68 (20.4)	

* $p < 0.05$

The relationship between teachers' knowledge and confidence scores was investigated using Pearson's product-moment correlation coefficient. There was a significant small positive correlation between the two variables, $r=0.24$, $n=122$, $p<0.01$ with higher level of asthma knowledge associated with higher level of confidence.

Discussion

School teachers have a duty of care for all children while attending school or participating in school related activities. This duty of care applies particularly to children with a health condition such as asthma. In regard to children with asthma, teachers are often required to make decisions on appropriate physical activities supervise regular medications observe for signs of breathing difficulties and other symptoms and deal with worsening of asthma symptoms or an acute asthma attack. A sound knowledge of asthma is required by primary school teachers in order to provide a safe environment for the child with asthma and to be confident in helping and supporting them. Previous research has shown that teachers' knowledge and understanding of asthma can have significant impact on the health status of their students with asthma (Ones et al., 2006; Hussey et al., 1998). However, both national and international studies suggested that school staff were not satisfactorily aware of the illness and not adequately prepared to handle an asthma emergency (Madsen et al., 1992; Eisenberg et al., 1998; Hussey et al., 1999; Brookes and Jones, 1992; Bevis and Taylor, 1990). In this study of rural primary school teachers, the results suggested that teachers were highly aware of asthma, achieving an average knowledge score of 26.3/31. The majority of items were answered correctly by most teachers indicating their knowledge extended across a range of areas such as asthma causes, triggers, and management. The main knowledge deficit identified were two items answered correctly by less than half of the sample. One item referred to the decision to take a child having an attack to an emergency department even if symptoms were mild and the other was that asthma was more of a problem at night. It could be that the teachers who got the first item wrong were not confident in dealing with an attack. The second item might be explained by them having to deal with

the problem at the daytime. Teachers' awareness about asthma symptoms was also demonstrated when 98.4% of them listed at least one correct symptom of asthma. Teachers' scores in the current sample were higher than scores reported by other studies using the same test. Gibson et al.'s study of secondary school teachers reported an average score of 14.9 (Gibson et al, 1995), whereas Henry et al.'s (2004) evaluation of a teacher-led asthma education program in a sample of secondary schools also reported lower asthma knowledge scores for teachers in both the intervention and control groups at pre-test (15.25, 15.27) and post-test (18.96, 15.60) respectively. In the current study, within-group comparisons found no significant differences in asthma knowledge scores by gender, teachers with and without asthma, or by family history of asthma. Others have examined gender in relation to teachers' knowledge of asthma. Gibson et al. (1995) found female teachers scored significantly higher than male teachers (15.80 vs. 13.88) on the Newcastle Asthma Knowledge Questionnaire, and Henry et al.'s (2004) study demonstrated similar results with female teachers scoring significantly higher than male teachers (19.90 vs. 17.90) but neither provided an explanation for this difference. It is surprising that teachers in the current study who had asthma or a family history of asthma did not score higher on the asthma knowledge test as was the case in other studies (Lucas et al., 2012; MacLehose et al., 2001). Teachers with asthma or those with greater exposure to people with asthma are expected to get higher knowledge scores.

Although teachers might have a satisfactory level of asthma knowledge, they may not necessarily be capable of acting confidently in assisting children with asthma specifically in an emergency. Therefore, the current study also investigated teachers' confidence in managing children with asthma while at school. Overall, teachers in this study had moderately high confidence in managing children with asthma achieving an average confidence score of 70.6%, although level of confidence did vary according to the situation. For example, teachers were more confident helping a child to use their inhaler during an asthma attack or taking them on a school excursion or camp than managing an asthma attack themselves rather than taking the child to hospital. Results from other studies are less favourable. In one study, 88% of teachers claimed they were not confident in managing children with asthma, and only 55% were confident they could manage a child experiencing an acute asthma attack (Hussey et al., 1999). A survey of primary school teachers in London by Bevis and Taylor (1990) also found teachers lacked confidence in managing children with asthma on school trips. Also examined in this study was whether teachers' confidence varied according to gender, if they had asthma, or if they reported a family history of asthma. As expected, teachers with asthma and a family history of asthma were significantly more confident in their ability to manage a child with asthma.

While teachers with asthma or family history of asthma scored similar knowledge level as those without, their confidence in managing children with asthma was higher. Having high level of asthma knowledge didn't synchronize with that of their confidence. Perhaps teachers need more than education to improve their confidence. The results were also supported by the small positive relationship detected between teachers' asthma knowledge and their confidence in managing children with asthma. One would say the more a teacher is knowledgeable about asthma and its management the more confident they are in dealing with children with asthma. Special training is recommended while preparing teachers to be confident in managing children with asthma. Additional research is recommended on the effect of asthma history on teachers' confidence in managing children with asthma in their classroom and methods of improving it.

Conclusion

The current sample of Gippsland teachers were well prepared to assist and manage children with asthma in their classroom. Community-level campaigns conducted over the previous 20 years might have helped improve their awareness on the illness and increased their confidence in managing children with asthma. Special training is recommended while preparing teachers to be confident in managing children with asthma, and additional research is recommended on the effect of

asthma history on teachers' confidence in managing children with asthma.

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References

Allen R, Abdulwadud O, Jones M, Abramson M, Walters H. (2000) A reliable and valid asthma general knowledge questionnaire useful in the training of asthma educators. *Patient Education and Counselling*, 39:237-242.

Asthma Foundation of Australia. (2007) Asthma - the figures. Accessed March 2013. http://www.asthma.org.au/

Bahari M and Ab Rahman A. (2003) A knowledge of asthma in school children: A survey among primary school teachers. *Singapore Medical Journal*, 44(3):131-135.

Bevis M and Taylor B. (1990) What do school teachers know about asthma? *Archives of Disease in Childhood*, 65:622-625.

Braman S. (2006) The Global Burden of Asthma. *Chest*,130(1):4s-12s.

Brookes J and Jones K. (1992) Schoolteachers' perceptions and knowledge of asthma in primary schoolchildren. *British Journal of General Practice*, 42:504-507.

Eisenberg J, Moe E, Stillger C. (1993) Educating School Personnel About Asthma. *Journal of Asthma*, 30(5): 351-358

Fall A, Henry R, Hazell T. (1998) The use of an intensive computer program for the education of parents of asthmatic children. *Journal of Paediatrics and Child Health*, 34:127-130.

Fitzclarence C and Henry R (1990). Validation of an asthma knowledge questionnaire. *Journal of Paediatrics and Child Health*, 26:200-204.

French D and Carroll A. (1997) Western Australian Primary School Teachers' Knowledge About Childhood Asthma and Its Management. *Journal of Asthma*, 34(6):469-475.

Gibson PG, Henry R, Vimpani G, Halliday J. (1995) Asthma knowledge, attitudes, and quality of life in adolescents. *Archive of Disease in Childhood*, 73(4):321-326.

Hazell J, Henry R, Francis L. (2006) Improvement in asthma management practices in child care services: An evaluation of a staff education program. *Health Promotion Journal of Australia*,17(1):21-26.

Henry R, Gibson PG, Vimpani G, Francis L, Hazell J. (2004) Randomized controlled trial of a teacher-led asthma education program. *Paediatric Pulmonology*, 38:434-442.

Ho J, Bender BG, Gavin L, O'Connor SL, Wamboldt M, Wamboldt F. (2003) Relations among asthma knowledge, treatment adherence, and outcome. *Journal of Allergy and Clinical Immunology*,111(3):498-502.

Hussey J, Cahill A, Henry D, King A-M, Gormley J. (1999) National School Teachers' Knowledge of Asthma and its Management. *Irish Journal of Medicine Sciences*, 168(3):174

Khan MS. (2003) *Improving the management of childhood asthma*. Sydney: Retrieved from Australasian Digital Thesis Program (Record No. 128361).

Lenney W. (1997) The Burden of Pediatric Asthma. *Pediatric Pulmonology*, 15:13-16.

Lucas, Anderson and Hill. (2012)What level of knowledge do elementary school teachers possess concerning the care of children with asthma? A pilot study. *Journal of Pediatric Nursing*, 27(5):523-527.

Madsen L, Storm K, Johansen A. (1992) Danish primary schoolteachers' knowledge about asthma: results of a questionnaire. *Acta Paediatrica*, 81:413-416.

MacLehose R, Rao M, Dyson J, Milnes P. (2001) Asthma knowledge and management in primary schools in south Essex, UK. *Health Education*, 101(6):255-263.

Martinez C and Sossa M. (2005) Validation of an asthma knowledge questionnaire for use with parents or guardians of children with asthma. *Archivos De Bronconeumologia*, 41(8):419-424.

Mesters I, Meertens R, Crebolder H, Parcel G. (1993) Development of a health education program for parents of preschool children with asthma. *Health Education Research*, 8:53-68.

Mutius E. (2000) The burden of childhood asthma. *Archives of Disease in Childhood*, 82:ii2-ii5.

Ones U, Akcay A, Tamay Z, Guler N and Dogru M. (2006) Asthma Knowledge Level of Primary Schoolteachers in Istanbul, Turkey. *Asian Pacific Journal of Allergy and Immunology*, 24: 9-15

Shah S, Gibson P, Wachinger S. (1994) Recognition and crisis management of asthma in schools. *Journal of Paediatrics and Child Health*, 30:312-315.

Wells H. (2000) *The knowledge, behaviour, fears and concerns of adolescents with asthma: A descriptive study* (Masters Thesis, University of Alberta).

Woolcock AJ, Bastiampilli S, Marks G, Keena V. (2001) The burden of asthma in Australia. *Medical Journal*