

# Knowledge, Attitudes, and Practices Regarding Chickenpox Disease and Its Prevention in Singapore: Comparison between Parents and Medical Students

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## ABSTRACT

**Introduction:** The incidence of chickenpox in Singapore is steadily increasing despite the availability of effective preventive measures. To address the need for improvement in public education, a survey was conducted to establish if differences exist amongst parents and medical students with regards to their knowledge, attitudes, and practices regarding chickenpox and its prevention.

**Methods:** Over a six-week period in 2010, an online survey involving parents who attended a paediatric clinic, and medical students from the National University of Singapore, was conducted.

**Results:** Parents had a significantly greater lack of knowledge compared to medical students ( $P < 0.001$ ). Family and friends were the main source of information for parents and junior medical students, unlike senior medical students who learnt more from physicians. A large majority of responders (85.2%) favoured vaccination for varying reasons, with parents and junior students being more concerned about the spread of disease and favouring its avoidance, and senior students fearing life-threatening complications. Parents who would not recommend the vaccine considered chickenpox a rite of passage and believed the vaccine lacks long-term benefits, while a perception that the disease is mild was more prevalent among medical students. A better understanding of the disease and vaccine was the most influential factor for changing decisions against vaccination.

**Conclusion:** Greater efforts to disseminate information about chickenpox disease and its prevention are needed to address important deficits in public health and medical school education. Being aware that chickenpox can be more than just a mild disease with serious complications may increase the uptake of chickenpox vaccination.

*Keywords:* Attitudes, Chickenpox, Knowledge, Medical students, Parents

## INTRODUCTION

Chickenpox though mild remains challenging as outbreaks occur frequently among all age groups resulting in loss of school and work hours<sup>1</sup>. In Singapore, the annual incidence of reported cases increased from 14,999 in 2003 to 24,031 in 2006. The last released figures of chickenpox notification was published on 27 August 2007, and ceased thereafter as mandatory notification of chickenpox disease was discontinued. The cumulative incidence within the first 34 weeks of 2007 was 20,390 compared to 16,542 the previous

year, demonstrating a worrying trend<sup>2</sup>. The known complications of severe respiratory<sup>3</sup> and central nervous system morbidity associated with varicella illness resulting in mortality or adverse long-term disability continues to be a healthcare concern<sup>4,5,6</sup>.

Medical professionals play an important role in educating the public on disease manifestation and prevention. Public attitudes and practices regarding the prevention of chickenpox disease may be influenced by their knowledge regarding the spectrum of varicella disease and availability of effective preventive strategies through immunisation<sup>7</sup>. However, misleading personal beliefs of healthcare professionals may result in unnecessary biased sharing of information

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regarding the disease and its prevention<sup>8</sup>.

Parents are advocates of children's health and well-being. Accurate knowledge and appropriate beliefs regarding chickenpox disease and available preventive strategies can influence the practices they adopt for preventive care<sup>9</sup>. To address the need for improvement in public education on chickenpox disease and its prevention, a survey was conducted to establish if differences exist amongst parents and medical students with regards to their knowledge, attitudes, and practices regarding chickenpox disease and its prevention.

## METHODS

### *Study Population and Survey*

This cross-sectional study was conducted over a six-week period from April to June 2010, targeting three groups: (i) a convenience sample of 100 families attending the Baby and Child Clinic at the Singapore General Hospital, (ii) a random sample of 100 junior (third year) medical students, and (iii) a random sample of 100 senior (fourth year) medical students from the Yong Loo Lin School of Medicine, National University of Singapore.

An electronic survey was created using SurveyMonkey®, a comprehensive online survey tool that keeps all data private and has an enhanced Secure Sockets Layer (SSL) encryption package to protect the survey link and survey pages during transmission<sup>10</sup>. One parent from each family approached at the Baby and Child Clinic would provide responses to an interviewer who took about 15–20 minutes to administer the online survey. Randomly selected medical students were invited to participate in the survey via email, their responses tracked, and an email reminder sent a week later for those who did not respond to the initial email invitation. A password was required for the medical students to participate in the self-administered online survey. To ensure that they could only take the survey once, responses were restricted to one per Internet Protocol (IP) address. No participant identifiers were collected.

The survey consisted of eight multiple choice questions on demographics, 15 questions (9 multiple choice and 6 matrix of choices) assessing knowledge of chickenpox transmission, clinical presentation, complications, groups at risk, and methods of prevention, as well as two questions (1 multiple choice and 1 matrix of choices) to

determine the reason(s) behind recommendation or non-recommendation of chickenpox vaccine. For respondents who chose not to recommend the vaccine, there was an additional matrix of choices question to explore factors that would change their decision regarding vaccination.

A composite varicella knowledge score was computed from each participant's responses to six questions. With the exception of the first question, these are matrix of choices questions with "yes" or "no" as responses for each row: (i) do you think chickenpox is contagious, (ii) do you agree that chickenpox may spread through the following ways: skin contact, sneezing, blood contact, sharing of food, (iii) do you agree that chickenpox can present with the following: fever, headache, body aches and pains, sore throat, rash, cough, abdominal pain, drowsiness, (iv) do you agree that chickenpox disease can lead to severe disease of the following: eye, lung, brain, joints, scarring of skin, abnormalities in fetus (for disease during pregnancy), (v) who do you think is at risk of chickenpox: children less than one year-old, children one to three years old, children 4 to 12 years old, teenagers 13 to 18 years old, adults, (vi) what do you consider as effective ways of preventing chickenpox: eating a healthy balanced diet, vitamin supplementation, hand hygiene, observing cough etiquette e.g. cover your cough or sneeze, staying away from people with the disease, avoiding skin contact with people with the disease, vaccination. Each correct response was awarded one point, with a maximum possible score of 31 points. No penalty was imposed for incorrect responses. The composite score allows for comparison of knowledge among the three groups of participants. This study was approved by the SingHealth Centralised Institutional Review Board.

### *Statistical Analyses*

Chi-square test was used to compare categorical variables, and the Kruskal-Wallis test for comparison of median composite knowledge scores of the three groups surveyed. A *P* value of less than 0.05 was considered statistically significant. Data were analysed using SPSS for Windows version 17.0.

## RESULTS

Ninety-eight parents, 92 junior medical students, and 88 senior medical students completed the survey, corresponding to a response rate of 98%, 92%, and 88%, respectively. Two parents were

excluded for incomplete surveys. There were eight junior and 12 senior medical students who did not accept invitation to participate in the survey despite a reminder. The majority of survey participants were Singapore citizens or permanent residents who had a monthly household income of more than \$5000 (Table 1). While the ethnic distribution of parents surveyed resembled the local population, more than 90% of medical students were Chinese. A significantly greater proportion of medical students surveyed had chickenpox before, compared to parents (87.2% vs 73.5%,  $P < 0.001$ ). The majority knew of family members or friends who have had chickenpox (parents 85.7%, students 95.6%). Most participants recalled that they were not vaccinated against chickenpox (parents 80.6%, junior students 63.0%, senior students 87.5%).

Although more than a third in each group did not consider it a serious disease (parents

37.8%, junior students 46.7%, senior students 38.6%), most thought that chickenpox should be prevented (parents 77.6%, junior students 85.9%, senior students 81.8%), and that vaccination is an effective way to prevent chickenpox (parents 78.6%, students 93.3%;  $P < 0.001$ ) and reduce its occurrence in the community (parents 91.8%, junior students 95.7%, senior students 96.6%). Of those who considered vaccination ineffective to prevent chickenpox, a large proportion believed that this is because natural infection is superior (parents 17/21, junior students 7/7, senior students 4/5), prevention of disease is not guaranteed (parents 19/21, junior students 7/7, senior students 5/5), and that the effect of vaccination does not last (parents 13/21, junior students 7/7, senior students 2/5). A smaller proportion of this group also thought that the chickenpox vaccine causes contagious disease (parents 8/21, junior students 3/7, senior students 2/5).

Table 1. Demographics of Survey Participants.

Demographic characteristics	Parents (%) (n = 98)	Junior students (%) (n = 92)	Senior students (%) (n = 88)
Age since last birthday			
< 20 years old	0	53.3	0
20 – 29 years old	14.3	46.7	100.0
30 – 39 years old	65.3	0	0
40 years old and above	20.4	0	0
Married	100.0	0	0
Females	67.3	54.3	53.4
Ethnicity			
Chinese	55.1	94.6	92.0
Malay	21.4	1.1	2.3
Indian	7.1	3.3	4.5
Other	16.3	1.1	1.1
Nationality			
Singapore citizen	60.2	97.8	88.6
Permanent resident	35.7	2.0	9.1
Others	4.1	0	2.3
Monthly household income			
Less than \$1000	4.1	2.2	1.1
\$1000 - \$3000	17.3	12.0	6.8
\$3001 - \$5000	13.3	16.3	22.7
More than \$5000	65.3	69.6	69.3
Housing type			
HDB* 1 or 2 room	8.2	0	1.1
HDB 3 room	14.3	3.3	1.1
HDB 4 room	27.6	12.0	9.1
HDB 5 room or executive	38.8	33.7	25.0
Private apartment	9.2	26.1	20.5
Landed property	2.0	25.0	43.2

\* HDB: Housing Development Board – Singapore's public housing authority

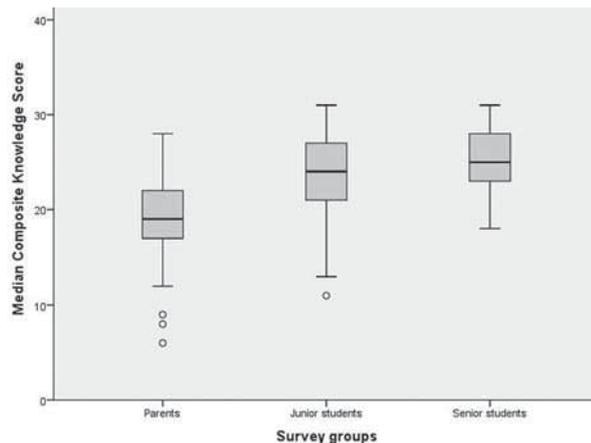


Fig. 1. Comparison of median composite knowledge scores among parents, junior, and senior medical students.

The median composite varicella knowledge scores were significantly higher among medical students compared with parents (Fig. 1). Parents who agreed that chickenpox should be prevented scored significantly higher than those who disagreed, both in the composite knowledge scores (median, interquartile range: 19.5, 17–22 vs 18, 14–20;  $P = 0.017$ ), and in the knowledge of complications (median, interquartile range: 3, 2–5 vs 2.5, 2–3;  $P = 0.030$ ). However, there were no significant differences in the composite knowledge scores (median, interquartile range: 25, 22–27 vs 23, 21–26.5;  $P = 0.080$ ), and in the knowledge of complications (median, interquartile range: 5, 4–6 vs 5, 3–6;  $P = 0.406$ ), between medical students who agreed and those who disagreed that chickenpox should be prevented. There was an increasing trend in the median composite knowledge scores of parents as the monthly household income bracket increases [median scores (income bracket), 17.5 (less than \$1000), vs 17 (\$1000 - \$3000), vs 19 (\$3001 - \$5000), vs 20 (more than \$5000);  $P = 0.165$ ], but this did not reach statistical significance. A similar trend was not observed among medical students, whose highest median composite knowledge scores came from three students whose monthly household income was less than \$1000 (median 26, interquartile range: 20–26).

Family and friends are the greatest source of information on chickenpox prevention for parents, followed by general practitioners and polyclinics, paediatricians, and various sources of mass media (Table 2). Magazines, posters and the radio were

the least frequent sources for parents. Among medical students, juniors learnt about chickenpox prevention mostly from family and friends, followed by general practitioners and polyclinics, and the internet. This differed from senior medical students who learnt mostly from physicians (general practitioners and polyclinic staff, followed by paediatricians), rather than family and friends.

The majority of survey participants would recommend the use of chickenpox vaccines. Most parents and junior medical students felt that vaccination is recommended as chickenpox is contagious and that it is better to avoid the disease altogether. This differed from senior medical students, majority of whom recommended vaccination for fear of life-threatening complications (Table 3). Most parents who would not recommend the vaccine felt that it provides no long-term benefit and considered infection with chickenpox a rite of passage. More medical students than parents felt that chickenpox is a mild disease not worth vaccinating against. Among parents and junior medical students who would not recommend the vaccine, a better understanding of the disease and vaccine was the most frequently selected factor that will cause them to change their thoughts about the vaccine. Cost of vaccine was a more influential factor among medical students than parents.

## DISCUSSION

This study has highlighted the need for improvement in public and medical school education on chickenpox disease. Medical students scored significantly higher than parents with regards to knowledge of chickenpox transmission, clinical presentation, complications, groups at risk, and methods of prevention. However, it is surprising that a proportion of parents scored just as well or even better than medical students.

Despite the fact that the chickenpox vaccine has been available in Singapore for the past 16 years since 1996<sup>1</sup>, significantly fewer parents than medical students consider vaccination an effective preventive measure. Misconceptions regarding vaccine efficacy among parents should be addressed. Dispelling incorrect perceptions of the vaccine among our future generation of doctors is a more pressing need, especially when numerous reports establishing the effectiveness of the vaccine<sup>11-16</sup> and recommendations for routine

varicella vaccination have been published more than a decade ago<sup>17-18</sup>. While more knowledgeable parents agreed that chickenpox should be prevented, level of knowledge did not seem to influence the decision to take active preventive measures among medical students. Information on chickenpox prevention was derived more from family and friends than from doctors, for both parents and junior medical students. For all three groups surveyed, general practitioners and polyclinics were important sources of information. This is in contrast to a similar study conducted among parents in the United States (US), which showed that lay media was the most frequently mentioned source of information on chickenpox vaccine, followed by the child's healthcare provider and friends<sup>19</sup>.

More parents and junior medical students favoured vaccination because they believed that chickenpox is contagious and that it is better to avoid the disease altogether, rather than for fear of shingles or life-threatening complications. Similar to a study conducted in the US<sup>19</sup>, a high proportion of these two groups was influenced by their doctor's recommendation. Senior medical students on the other hand demonstrated a similar pattern of reasoning to a group of general practitioners and paediatricians surveyed in Canada, most of whom considered complications of chickenpox as an important factor influencing decision to vaccinate<sup>20</sup>. For those who did not favour vaccination, only a small proportion considered it expensive, although reducing the cost of vaccine or making it free of

charge appeared to be able to influence more to change their minds regarding vaccination. Perceptions that the disease is mild and that the vaccine offers no long-term benefits were among the top reasons for not recommending vaccination. Hence it is reasonable to expect educating parents and medical students on the potential serious complications of chickenpox, as well as vaccine efficacy, to result in higher rates of vaccination. This is further supported by the fact that for most of those who would not recommend the vaccine, a better understanding of the disease and vaccine would enable them to reverse their decision.

Medical students have demonstrated greater knowledge than parents in this study, but the reason for this difference is not clear. As much as it is hoped that medical school education had given them this advantage, this study had also found that a significantly higher proportion of medical students than parents surveyed had been infected with chickenpox before. However, our results suggest that self-experience may not be the better teacher as there was no significant difference in median composite knowledge scores between medical students who had and those who had not been infected before (median, 24 vs 24;  $P = 0.436$ ). The lower than expected scores among medical students in this study demonstrate deficits which need to be addressed in medical school education.

There are no known published Singaporean data on parental knowledge, attitudes, and practices regarding chickenpox and its prevention. To date,

Table 2. Sources of information on chickenpox prevention.

Sources	Parents (%) (n = 98)	Junior students (%) (n = 92)	Senior students (%) (n = 88)
Paediatricians	42.9	16.3	70.5
General practitioners / polyclinics	46.9	60.9	72.7
Family and friends	80.6	68.5	54.5
Internet	35.7	45.7	39.8
Television	25.5	12.0	6.8
Radio	8.2	4.3	3.4
Newspaper	33.7	27.2	18.2
Magazines	18.4	5.4	9.1
Brochures	40.8	20.7	26.1
Posters	12.2	14.1	18.2

Note: Multiple responses were allowed, so total percentages exceed 100%

Table 3. Reasons for Decision on Vaccine Recommendation.

Decision	Parents (n = 98)	Junior students (n = 92)	Senior students (n = 88)
<b>Would recommend vaccine, n (%)</b>	81.6	87.0	87.5
Reasons, (%)*			
Fear of life threatening complications of disease	56.3	80.0	98.7
Fear of shingles	55.0	90.0	71.4
Better to avoid disease altogether	92.5	97.5	87
Disease is contagious	90.0	97.5	96.1
Doctor said so	68.8	77.5	68.8
<b>Would not recommend vaccine, n (%)</b>	18.4	13.0	12.5
Reasons, (%)*			
Disease is mild	61.1	83.3	90.9
No long-term benefit of vaccine	72.2	66.7	54.5
Disease is a rite of passage	72.2	41.7	54.5
Another injection for the child	33.3	25.0	36.4
Unsure of vaccine efficacy	61.1	50	36.4
Vaccine side-effects	55.6	25.0	27.3
Vaccine is expensive	16.7	33.3	36.4
<b>Factors that will change decision on vaccine, (%)*</b>			
Make vaccine free of charge	38.9	58.3	63.6
Reduce cost of vaccine	33.3	58.3	63.6
Incorporate vaccine into a single injection with another vaccine	50.0	50.0	72.7
Better understanding of vaccine and disease	88.9	100.0	54.5

\* Multiple responses were allowed, so total percentages exceed 100%

this is the first study to compare the responses of parents with those of medical students. Results of our study may be of special interest to paediatricians and family medicine practitioners who serve as important advocates for the health of children and the well-being of the community in general. Glanz et al demonstrated in a matched case-control study that children of parents who refused varicella vaccines were at a greatly increased risk of varicella infection requiring medical care (odds ratio, 8.6; 95% confidence interval, 2.2–33.3), relative to vaccinated children<sup>21</sup>. Together with medical educators and public health policymakers, it is the responsibility of everyone involved in

the education of future generations of doctors as well as the general public, to invest greater effort in promoting potentially lifesaving information and practices.

A small sample size does however limit the generalisability of the results of this study. Parents surveyed in this study were all attending a paediatric clinic located in a government restructured tertiary hospital and may represent a better-educated group with greater financial means and access to health services. As such, their knowledge and preferences may differ from parents surveyed in other healthcare settings, such as government

polyclinics and privately managed family medicine clinics, or non-medical environments, such as educational institutions and childcare centres. Parents in this study were also surveyed at a single visit to the clinic and were likely to have children at various stages of the immunisation schedule. It was not known if most of their children were too young for the parents to have had a timely discussion about varicella vaccines with their paediatricians, which may in turn affect their knowledge of chickenpox disease and preferences for the vaccine. Medical students in this survey were also restricted to those from the Yong Loo Lin School of Medicine, and may have responded differently from those belonging to a graduate medical programme. These students were in their third and fourth year of medical school and so may have different levels of knowledge and practice recommendations from those at the extremes of their medical education.

A larger population-based study designed with the above limitations in mind would provide results with greater external validity. A study conducted among medical students from various programmes and at different stages of learning will provide a clearer idea of the effectiveness of medical education. Future research is needed to study the frequency of varicella vaccine uptake and how it is related to factors such as physician immunisation practices and incidence of chickenpox and its complications, including social and economic impacts. This would provide an objective assessment of disease burden and inform future varicella immunisation recommendations, public health, and medical school education.

## CONCLUSION

There are important deficits in public health and medical school education that needs to be addressed. Greater efforts to disseminate information about chickenpox disease and its prevention are needed among parents, who have a more profound lack of knowledge. Important misconceptions regarding vaccine efficacy need to be addressed, especially among medical students who represent future generations of doctors. Further research is required to objectively assess disease burden, cost-effectiveness of the vaccine, and physician preferences in influencing chickenpox vaccine uptake. A structured approach will facilitate consideration to incorporate chickenpox vaccine into the national

immunisation schedule as part of an effective public health programme.

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