

# The effectiveness of raising Hong Kong parents' awareness of antimicrobial resistance through an educational program with peer support on social media: A pilot study

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## Research article

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# Abstract

## Background

To test whether parents' awareness of antimicrobial resistance could be improved through the education programme with peer support on social media

## Methods

A cluster randomized controlled trial with two-arms were implemented. The intervention program consisted of two weekly sessions and each session lasted for 90 minutes. A total of 48 parents had participated in the program. Parental knowledge, attitude, and their social network were measured before and after the program using the Parental Perception on Antibiotics (PAPA) scale and the General Self-Efficacy Scale (GSE) to assess differences between and within the intervention and control groups.

## Results

All parents would have a sense that antibiotics could be effective at treating some infections and not others, as compared to 40% in the control group. All parents in the intervention group and 85% of the control group disagreed that they should reduce the dose of antibiotics when their children were recovering. The test was statistically significant ( $p = 0.039$ ) with a  $p$  value  $< .05$ . There was a significant difference and a strong negative correlation between peer support in Facebook and the parents' belief that antibiotics could be stopped when their children felt better, with Pearson coefficient of  $-0.78$  and  $p = 0.001$ . In general, there was no significant difference between the two groups with respect to the GSE scale.

## Conclusions

Based on the findings in this pilot study, a further study based on the education program with enhancement and peer support can be implemented in a large scale with a positive expectation of increasing parental awareness of antimicrobial resistance and potentially influencing patient prescribing expectations when seeking healthcare.

## Background

Overuse and misuse of antibiotics are the main causes of antimicrobial resistance which harm both individuals and the community.<sup>1</sup> Many doctors felt that they were pressurized by patients to prescribe antibiotics for viral infections such as influenza or cold.<sup>2</sup> The 2010 Eurobarometer found that over 50% of adults still believed antibiotics could treat colds.<sup>3</sup> A 2015 Hong Kong study found that 7.8% of the interviewees bought antibiotics without a prescription.<sup>4</sup> It is also evident that suboptimum compliance of antibiotic use, including taking leftover antibiotics from previous treatment courses and sharing unused antibiotics among household members or friends, is common in both developed and developing countries.<sup>5</sup> In particular, it has been found that antibiotics are commonly prescribed for children with medical conditions, including viral respiratory infections for which they provide no benefit.<sup>6</sup> Inappropriate use of antibiotics in children is a known issue and has generated widespread social concern.<sup>7</sup> Besides causing antimicrobial resistance, it also leads to the development of adverse gastrointestinal effects in children.<sup>8</sup> Not only parents but different parties' such as prescribers who contribute to the potential of antibiotic overuse. To reduce antibiotic overuse in children, strategies need to be developed by first assessing parents' knowledge in respiratory illnesses and their treatment.<sup>8</sup> Parents, as carers of

their children, the primary medicine administrators, have a key role to play. However, they have inadequate knowledge about antibiotics and diseases.<sup>9</sup> Some parents self-mediate antibiotic to their children. In view of this harmful behavior, parents should be educated first with accurate information on both antibiotics and infectious diseases instead of having access to antibiotics without prescriptions.

To induce parents' positive behavior change in health needs of their children, in this study, we adopted a Behaviour Change Technique Taxonomy Version 1<sup>10</sup> to specify the intervention. We hypothesized that with peer support can motivate their learning efforts as antibiotics consumers. Most education programs on antimicrobial resistance focus on healthcare professionals, particularly clinicians.<sup>11</sup> There are, however, no programs for adults of the general population, particularly the parents of children aged 12 or younger. We conducted a pilot study in a small sample of kindergartens to examine the participating parents' ability to comprehend and follow antibiotic usage information before and after an education program whilst receiving peer support through an online social platform to achieve behavior and attitude change in antibiotic use. Our objective was to test whether parents' awareness of antimicrobial resistance could be improved through this program.

## Methods

### Design

A cluster randomized controlled trial with two-arms were implemented to assess the efficacy of behavior change in decisions on antibiotic use in relation to childhood infection.

### Setting

For confidentiality, computer generated numbers were used as codes to recruit kindergartens and parents of kindergarteners aged under 7, as clusters, to the intervention and control groups.

### Participants

The subjects were selected according to the inclusion criterion that they were parents of kindergarteners aged below 7. Kindergartens were selected from the same region to ensure that the demographics of the two groups were comparable. Randomization was implemented by putting the sealed codes for selection inside a paper bag. The sample was then drawn randomly by an individual who was not associated with the study for allocation concealment to prevent selection and confounding biases. The parents in the intervention group were asked to join an education program on antibiotic usage and a peer support group, whereas those in the control group were only given information leaflets on antibiotics from the Centre for Health Protection.

### Procedure

The intervention program consisted of two weekly sessions and each session lasted for 90 minutes. An infection control nurse was conducted all the training and no changes during the intervention to maintain standardization of the information. The participating kindergartens sent training reminders to the parents one week before each session. Interventions addressing antibiotic use were administrated in two formats: a functional session (Week 1: the basic

knowledge on viral and bacterial infections) and an interactive session (Week 2: case studies on consulting behavior, management planning and experience sharing). The parents in the intervention group, together with a pharmacist and an infection control nurse, would join a Facebook Page of Antibiotic Use at the beginning of the program. This page provided consultation services, the consultation services would allow these participants to build a social network to send and receive instant online advice amongst the team members on antibiotic issues. On the online platform, news about antibiotic use or antimicrobial resistance were posted twice a week, they could interact with one another, thus strengthening parent-to-parent support.

To facilitate the assessment of the participating parents, survey packets containing the questionnaires and reminders to parents were sent to both the intervention and control groups from the participating kindergartens for use before the 2-week period. One participating parent of each child was asked to complete one set of questionnaires before and immediately after the program. The participants were instructed to fill out the questionnaires only once irrespective of the number of children attending the same kindergarten. The questionnaires took 20 minutes to complete.

Approval from the Research Ethics Committee was sought before recruitment and written consents were obtained from the parents concerned. The parents were informed that withdrawal at any time would not result in any negative consequences. All data were protected with passwords. Only the researcher and her team had access to the datasets to prevent any leakage of sensitive information.

## Measures

To measure peer support, the peer support outcome protocol adapted from the outcome evaluation indicators<sup>11</sup> was used. Specific outcomes that are available in the protocol include: demographics, service use, program satisfaction, participation in a discussion group.

Parental knowledge, attitude, and their social network were measured before and after the program using the Parental Perception on Antibiotics (PAPA) scale and the (GSE) scale to assess differences, if any, between and within the intervention and control groups.

The PAPA scale was administered to pre-test and post-test the participants' capability in comprehending and acting on antibiotics-related information (functional: the basic skills in understanding antimicrobial drug knowledge), Cronbach's  $\alpha = 0.78$ . The PAPA scale consists of 4 sections: 1) Children's health, 2) Antibiotics and health information, 3) Experience with antibiotics and health professionals, and 4) Personal attitudes and beliefs about antibiotics. The PAPA scale has 32 items measuring the factors influencing the overuse of antibiotics in children, especially those with upper respiratory tract infections. Parents were asked to rate on a 5-point Likert scale ranging from strongly disagree to strongly agree or from never to always on child health-related history, including the number of cold episodes and antibiotics (courses) used for the youngest child during the previous year (ranging from never to more than 6 times a year), whether any of the children in the family has ever had a serious infectious disease or a chronic disease, and items relating to factors influencing the parental use of antibiotics including knowledge and beliefs, behaviors, adherence, information seeking, awareness about antibiotics resistance, and their perception about doctors' prescribing behavior.<sup>6</sup> The parents in both groups were required to complete the self-reporting Generalized Self-Efficacy scale (GSE) before and after the program. GSE is a 10-item scale with a score ranging from 1 to 4 for each question. Higher scores indicate stronger parental belief in self-efficacy. The Cronbach's  $\alpha$  coefficient for the entire scale was 0.80 and the test-retest reliability coefficient was 0.69.<sup>11</sup>

## Statistical analysis

Descriptive statistics was used to group the numerical and categorical data of the study. Chi-square tests were undertaken to ascertain differences in baseline characteristics across groups of categorical data. Independent t tests were run to investigate differences in outcomes from parents' health behavior at baseline and follow-up. Mann Whitney U test was conducted to compare the difference of attitude of antibiotic use between the intervention and control groups. Correlation analysis was performed to analyze the relationship between social support and parents' personal attitude towards antibiotic use. For the estimation of effects, 95% confidence intervals were provided. The statistical significance for all tests was set at  $p < 0.05$ .

## Results

A total of 48 parents had participated in the program with four parents dropping out from the control group because of sickness or personal issues. As a result, 24 parents participated in the intervention group and 20 in the control group. The sex distribution of the participants was 3 (12.5%) males and 21 (87.5%) females for the intervention group, and 3 (15%) males and 17 (85%) females for the control group. On age range, it was 22 to 43 and 21 to 45 for the intervention and control groups respectively. The education level of the participants was 20 (83.3%) were graduated from secondary school and 4 (16.7%) graduated from University in the intervention group. In the control group the education level of the participants was 19 (79.2%) were graduated from secondary school and 5 (20.8%) graduated from University. No significant demographic differences were found between the two groups.

In Section 1 of the PAPA scale which covered children's health records, over half of the parents reported that the number of colds their youngest children had in the past year was 2 to 3 episodes of child cold for the intervention group and 3 to 4 episodes of child cold for the control group. Nearly half of the parents in both groups said that their youngest children took antibiotics in the past year—once a year and 2 to 3 times in the last year for the intervention and control group respectively. All parents in the intervention group and 30% in the control group responded that their children received seasonal influenza vaccine in the past 6 months. At the end of the second week of the training, all parents in the intervention group disagreed that antibiotics are effective against infections (virus, bacteria and fungi), as compared to 40% in the control group. From the Mann Whitney U test performed, a significant difference ( $p = 0.024$ ) (Table 1) was found. As shown in Table 2, all parents in the intervention group and 85% of the control group disagreed that they should reduce the dose of antibiotics when their children were recovering. The test was statistically significant ( $p = 0.039$ ).

In one item of the PAPA scale that asked if parents agreed that some bacteria could become resistant to antibiotics if the dose was insufficient, 25% of the parents in the intervention group chose "neutral" (neither agree nor disagree) before the program and 100% of them chose either "agree" or "strongly agree" after the program. On the other hand, the control group had 30% of the parents chose "neutral" to this item both before and after the two weeks. However, there was no significant difference between the two groups.

The parents' usage of the Facebook Page on Antibiotic Use was aligned with the data obtained from the PAPA scale questionnaire in that more than half of the parents obtained health-related information from the Internet. Through the Facebook Audience Insight Tool, the participants' behavior on the Facebook page was tracked. The page was a success and it was visited more than a hundred times a week with activities like posting messages and comments, and interacting with peers about antibiotic use. On analysis, a strong negative correlation was found between social support and parents' belief that antibiotics could cure their children's cold symptoms, with Pearson coefficient of -1 and  $p = 0.001$ , implying that they had learnt that antibiotics are not for colds. There was a significant difference and a strong negative correlation after the intervention between peer support in social media and the parents' belief that antibiotics could be

stopped their children felt better, with Pearson coefficient of -0.78 and  $p=0.001$ , implying that the program could change the parents' belief to proper antibiotic use (Table 3).

Item 1 of the GSE scale asked if it was true that the parents could always manage to solve difficult problems if they tried hard enough. It was found that no one in the intervention group regarded this statement as "exactly true" before the training; however, after the program, 25% of them agreed to the statement. In the control group, the percentage of parents responding as "exactly true" decreased from 15% to 10% after the two weeks. On the whole, there was no significant difference between the two groups with respect to the GSE scale (Table 4).

## Discussion

The aim of this pilot study was to test the feasibility of such a study at a regional level across Hong Kong. With a small sample size of 44 in this pilot, its analytical power is expected to be low and its predictions may be biased. However, we hope that this pilot can provide insights for the main study.

In this pilot, it was found that the participants in the intervention group did a little better in understanding common colds do not need antibiotics. Although this finding does not show that the program had a significant impact on correcting the misconception of using antibiotics for curing colds, yet the effect is expected to be significant when the study uses a large enough sample size. Another support for the main study is that the participants' knowledge of using antibiotics for viral infections had a significant improvement for the intervention group over the control group. This result was similar to that of Ekambi et al.'s study.<sup>13</sup> Another finding is that the knowledge on bacteria becoming more resistant to antibiotics was similar for both groups. This may provide insights to the modification of the education program. On the item that insufficient dose of antibiotics being the cause of antimicrobial resistance, the intervention group did a lot better than the control group. This finding coincides with the hypothesis of the study. Since both groups could not differentiate viral, bacterial and fungal infections, nor understand the effect of skipping antibiotics dosage in a medication course, and were not sure about whether antibiotics help speed up healing colds, we should further strengthen the design of our education program to achieve the desired results.

All in all, the pilot showed that parents learnt the basic knowledge on proper and inappropriate antibiotic uses with respect to antimicrobial resistance. The education program, however, should be enhanced in view of the difficulties the parents had in answering questions related to cold and cough symptoms. This study supported the findings that family and friends did influence medication taking.<sup>14</sup> Moreover, this study also demonstrated that parents' behavior was influenced by social support.<sup>15</sup> Our findings demonstrated that parents who were active in the social media were able to learn correct information on antibiotics in ways that other studies had not.<sup>16</sup>

Parents' perception of their self-efficacy affected their behavior. Parents valued consistent advice from a trusted source that could address their common concerns and help their decision making. Our findings showed an increase in parental self-efficacy scores after the training program in the intervention group while parental self-efficacy scores decreased in the control group. This result was similar to that of Gross et al.<sup>17</sup> which found a trend of growing parental self-efficacy in their parent training groups as compared to those in the control groups though the difference was not statistically significant. It is necessary to increase parental self-efficacy to support the development of knowledge and communication skills on antibiotic use<sup>18</sup> because one study had shown that parents with low self-efficacy were not able to put parenting knowledge into practice.<sup>19</sup>

## Conclusion

This pilot yielded positive preliminary results on improving basic knowledge of antibiotic use to reduce antimicrobial resistance. It also demonstrates that peer support could increase the self-efficacy of the parents to enhance their learning in these medication issues. Based on the findings in this pilot study, a further study based on the education program with enhancement and peer support can be implemented in a large scale with a positive expectation of reducing antimicrobial resistance.

## Abbreviations

Parental Perception on Antibiotics (PAPA) scale

General Self-Efficacy Scale (GSE)

## Declarations

Ethics approval and consent to participate

The ethical approval for the study was obtained from the Human Research Ethics Committee of The Education University of Hong Kong, and participants have provided written consent before taking part in the study.

Consent to publish

Not applicable

Availability of data and materials

Derived data supporting the findings of the study is available from the corresponding author on request.

Competing interests

There was no competing interest that need to be declared.

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Authors' Contributions

Ching has interpreted the data, and edited the manuscript. OR was a major contributor in generating the research idea, collecting data, analysis data, and writing the manuscript. All authors have read and approved the final version of the manuscript.

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## References

1. World Health Organization (31. July 2020). Antibiotics resistance. Retrieved from <https://www.who.int/news-room/fact-sheets/detail/antibiotic-resistance>.
2. Mehta N, Schilder A, Fragaszy E, Evans ER, Dukes H, Manikam O. L, et al. Antibiotic prescribing in patients with self-reported sore throat. *J Antimicrob Chemother*. 2017 72:914–922. doi.org/10. 1093/jac/dkw497 PMID: 27999063.
3. European Commission. 2010. Special Eurobarometer 445 Antimicrobial resistance report. Available from [https://ec.europa.eu/health/amr/sites/health/files/antimicrobial\\_resistance/docs/eb445\\_amr\\_generalreport\\_en.pdf](https://ec.europa.eu/health/amr/sites/health/files/antimicrobial_resistance/docs/eb445_amr_generalreport_en.pdf) [cited 2019 Dec 2].
4. Lam TP, Lam KF, Ho PL, Yung R. Knowledge, attitude and behavior toward antibiotics among Hong Kong people: Local-born versus immigrants. *Hong Kong Medical Journal*. 2015;21:7:41–7.
5. Zarb P, Goossens H. Human use of antimicrobial agents. *Rev Sci Tech*. 2012;31:121–33.
6. Alumran A, Hou X, Hurst C. (2013). Assessing the overuse of antibiotics in children in Saudi Arabia: Validation of the parental perception on antibiotics scale (PAPA scale) Health and Quality of Life Outcomes. 2013 March;11:39. Doi:10.1186/1477-7525-11-39.
7. Wang H, Wang B, Zhao Q, et al. Antibiotic body burden of Chinese school children: a multisite biomonitoring-based study. *Environ Sci Technol*. 2015;49:5070–79.
8. Al-Hassan MI. Community pharmacy practice in Saudi Arabia: an overview. *The Internet Journal of Pharmacology*. 2011;9 Available from: <http://ispub.com/IJPHARM/9/1/5301> [cited 2019 Jun 16].
9. Michie S, et al. The behavior change technique taxonomy (v1) of 93 hierarchically-clustered techniques: Building an international consensus for the reporting of behavior change interventions. *Ann Behav Med*. 2013;46(1):81–95. doi:10.1007/s12160-013-9486-6.
10. Lee CR, Lee JH, Kang LW, Jeong BC, Lee SH. Educational effectiveness, target, and content for prudent antibiotic use. *Biomed Res Int*. 2015. doi:10.1155/2015/214021.
11. Hawkings NJ, Butler CC, Wood F. Antibiotics in the community: a typology of user behaviors. *Patient Educ Couns*. 2008;73:146–52.
12. Laxminarayan, et al. Antibiotics resistance-the need for global solutions. *The Lancet Infectious Disease Commission*. 2013;17:13:70318–9. Doi.org/10.1016/S1473-3099.
13. World Health Organization. Peer Support programmes in diabetes. Report of a WHO consultation, 5–7. November 2007. Retrieved from [https://www.who.int/diabetes/publications/Diabetes\\_final\\_13\\_6.pdf](https://www.who.int/diabetes/publications/Diabetes_final_13_6.pdf).
14. Yildirim F, Ilhan I. The validity and reliability of the general self-efficacy scales Turkish form. *Turkish Journal of Psychiatry*. 2010;21:301–8.
15. Ekambi E, Ebongue O, Penda C, Nga EN, Mpondo EM, Moukoko CE. Knowledge, practices and attitudes on antibiotics use in Cameroon: Self-medication and prescription survey among children, adolescents and adults in private pharmacies. *PLOS One*. 2019. doi.org/10.1371/journal.pone.0212875.
16. Cheraghi-Sohi S, Jeffries M, Stevenson F, Ashcroft DM, Carr M, Oliver K, Rogers A. (2015). The influence of personal communities on the self-management of medication taking: a wider exploration of medicine work. *Chronic Illn*. 2015 11;2: 77–92.

17. Hempler NF, Joensen LE, Willaing I. (2016). Relationship between social network, social support and health behaviour in people with type 1 and type 2 diabetes: cross-sectional studies. BMC Public Health 2016;16:198.
18. Ellis J, Vassilev I, Kennedy A, Moore M, Rogers A. Help seeking for antibiotics; is the influence of a personal social network relevant? BMC Family Practice. 2019;20:63. doi.org/10.1186/s12875-019-0955-2.
19. Gross D, Garvey C, Julion W, Fogg L, Tucker S, Mokros H. Efficacy of the Chicago parent program with low-income African American and Latino parents of young children. Prev Sci. 2009;10:54–65. doi:10.1007/s11121-008-0116-7.

## Tables

Table 1. Questions on proper antibiotic use with PAPA scale

Question	Group	Strongly disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly agree (%)	P value
1. Common cold: need to take antibiotics	Intervention	75	25	0	0	0	0.142
	Control	35	55	10	0	0	
2. Sore throat: need to take antibiotics	Intervention	25	0	50	0	25	0.053
	Control	25	45	30	0	0	
3. Antibiotics are used to treat bacterial infections	Intervention	0	25	0	50	25	0.770
	Control	0	10	25	50	15	
4. Antibiotics are used to treat viral infections	Intervention	50	25	0	0	25	0.222
	Control	10	10	30	50	0	
5. Antibiotics can cure all types of infections (viruses, bacteria and fungi)	Intervention	50	50	0	0	0	0.024*
	Control	10	30	40	20	0	
6. Antibiotics help treat children with colds	Intervention	50	25	25	0	0	0.077
	Control	10	30	30	30	0	
7. Antibiotics can be harmful to human health	Intervention	0	0	50	25	25	0.481
	Control	0	15	40	40	5	
8. Some bacteria are getting harder to use antibiotics	Intervention	0	0	0	50	50	0.107
	Control	0	10	10	65	15	
9. Some bacteria can become resistant to antibiotics if the dose is insufficient	Intervention	0	0	0	50	50	0.183
	Control	0	0	30	45	25	

Table 2. Questions on experience with antibiotics with PAPA scale

Table 3. How to get health-related information table of correlations in parents

Question	Mean	SD	1	2	3
1. I get health-related information from my family or friends.	3.40	0.598	1.000		
2. I get health related information from the internet	3.50	0.688	0.128	1.000	
3. I get health-related information from the social media.	3.45	0.887	0.139	0.733**	1.000

\*\*p<0.005

Table 4. Summary of General Efficacy Scale (GES)

Question	Group	Strongly disagree (%)	Disagree (%)	Neutral (%)	Agree (%)	Strongly agree (%)	P value
1. If my child's condition feels better, I can reduce the dose of antibiotics.	Intervention	75	25	0	0	0	0.039*
	Control	20	65	5	5	5	
2. If my child is mild, I will give appropriate antibiotics according to the condition.	Intervention	75	25	0	0	0	0.063
	Control	25	55	0	15	5	
3. There is no difference in skipping the dose of one or two antibiotics.	Intervention	75	25	0	0	0	0.142
	Control	35	55	5	5	0	
4. If your child has symptoms of cough, cold or flu without taking antibiotics, my child will not get sick for a long time.	Intervention	50	25	25	0	0	0.235
	Control	15	45	30	10	0	
5. If my child has a cold or cough, it is best to use antibiotics to cure	Intervention	50	25	25	0	0	0.384
	Control	20	50	25	5	0	
6. When a child has a cold, using antibiotics can speed up healing	Intervention	25	50	25	0	0	0.280
	Control	20	25	25	30	0	
7. Strict adherence to antibiotic dose is not important	Intervention	75	25	0	0	0	0.137
	Control	35	50	10	5	0	

Question	Group	Not at all true (%)	Hardly true (%)	Moderately true (%)	Exactly true (%)	P value
1. I can always manage to solve difficult problems if I try hard enough	Intervention	0	25	50	25	0.421
	Control	5	35	50	10	
2. If someone opposes me, I can find the means and ways to get what I want	Intervention	0	50	50	0	0.429
	Control	10	60	25	5	
3. It is easy for me to stick to my aims and accomplish my goals	Intervention	0	50	50	0	0.580
	Control	0	35	65	0	
4. I am confident that I could deal efficiently with unexpected events	Intervention	0	50	50	0	0.727
	Control	5	35	55	5	
5. Thanks to my resourcefulness, I know how to handle unforeseen situations	Intervention	0	50	50	0	0.678
	Control	20	35	40	5	
6. I can solve most problems if I invest the necessary effort	Intervention	0	25	75	0	0.353
	Control	0	15	65	20	
7. I can remain calm when facing difficulties because I can rely on my coping abilities	Intervention	0	25	75	0	0.641
	Control	10	25	65	0	
8. When I am confronted with a problem, I can usually find several solutions	Intervention	0	50	50	0	0.351
	Control	5	20	70	5	
9. If I am in trouble, I can usually think of a solution	Intervention	0	50	50	0	0.277
	Control	0	25	65	10	
10. I can usually handle whatever comes my way	Intervention	0	50	50	0	0.614
	Control	5	35	45	15	

## Supplementary Files

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