
Probiotics: Popping the Prevalence and Parental Perspective

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Abstract: The aim of this project was to evaluate parental knowledge and opinions on the use of probiotics in children, specifically comparing those attending an allergy or gastroenterology clinic with parents of other paediatric patients. A survey containing nine items was administered to a convenience sample of parents in the inpatient and outpatient departments at the Children's Hospital for Wales. The questions were asked face to face by one observer; answers were recorded anonymously on a tablet computer using the online survey tool KwikSurveys. A total of 304 parents completed the survey. Overall, 53.9% of parents knew what probiotics were, 75.3% thought that they could improve a child's health and 53.6% had given their child probiotics. In the cohort attending allergy or gastroenterology clinics, 64.2% had given their child probiotics, compared with 50.2% of the remaining participants (OR 1.78; 95% CI 1.01, 3.12). Healthcare professionals were 13% more likely to recommend the use of a probiotic to a parent in this cohort. In conclusion, awareness and knowledge of probiotics was reasonable among parents, and most thought that they could improve a child's health. Parents were more likely to give their child probiotics if they attended an allergy or gastroenterology clinic.

Keywords: Probiotics, Allergy, Gastroenterology

1. What Is Known About This Topic

1. Probiotics are marketed in the media for general health.
2. Probiotics are proven for only a few specific indications in children.
3. Few data exist on parental views on probiotic use in children.

2. What This Study Adds

1. Parents have a reasonable knowledge about probiotic use in children.
2. Children are frequently given probiotics, especially if they attend an allergy or gastroenterology clinic.
3. Doctors rarely ask about probiotic use.

3. Introduction

Probiotics can be defined in many ways. One widely used definition, which has been approved by the World Health

Organisation, is that probiotics are "Live microorganisms which when administered in adequate amounts confer a health benefit to the host". [1] Their exact mechanisms of action are as yet broadly unknown. [2, 3] Although significant health benefits are often claimed, many products sold in health food shops often give no health benefit and frequently have not been adequately researched. Multiple beneficial claims, unsupported by outcomes are also widely made on the internet and other advertising genre. A quick search on the internet reveals many sites proclaiming the benefits of probiotics to parents with few, if any, side effects being mentioned. Phrases used include "boost the gut microflora", provide "extraordinary health" and "reduce the risk of childhood illnesses as well as the time taken off school". [4-6] These general statements are not supported by evidence and therefore can be misleading.

Despite these problems, a few high-quality probiotics have been studied in children and can be useful for specific indications. Proven paediatric indications for using probiotics include: prevention of eczema in newborns born to higher risk

“allergic families” [7-9]; treatment of gastroenteritis, with the Cochrane review showing the reduction of minor infections and lower rates of antibiotic associated diarrhoea. [10-14] Debate exists over the role for probiotics in preterm infants to reduce the severity of necrotising enterocolitis. [15] The recent Cochrane review in 2020 of 56 trials in over 10,000 infants suggested that there may be a halving of the risk of NEC in children receiving probiotics. Their combined analyses showed that giving very preterm and very low birth weight infants probiotics may reduce the risk of necrotising enterocolitis, and probably reduces the risk of death and serious infection. These are significant results, although the reviewers express concern about the quality of some of the studies and call for larger randomised controlled trials (RCTS). [16] There is lesser evidence demonstrating probiotics can be used to lessen irritable bowel syndrome. The majority of these supportive data have been collected in adult populations. [17, 18]

There have been numerous studies which have explored the clinical uses of probiotics exclusively in adults. A paper summarizing the Cochrane systematic reviews concluded that probiotics can be of benefit for “diarrheal conditions and related GI symptoms”. There is some evidence to suggest that probiotics can be used for inflammatory bowel disease and liver disorders, however more studies are required to confirm this. This Cochrane review stated the need for further research into the optimal age at which probiotics should be given to acquire the maximal benefit. [19] The American Journal of Gastroenterology review in 2018 concluded that there was moderately good evidence for the prevention of antibiotic associated diarrhoea and *Helicobacter pylori* with certain probiotic strains, including *Lactobacillus* and *Bifidobacterium*. It suggested too that further data were required to support the use of probiotics in Crohn’s and ulcerative colitis. However, it viewed the collated evidence to date as promising. [20] A meta-analysis regarding their effectiveness in constipation conducted in 2014 found that *Bifidobacterium lactis* may improve “gut transit time, stool frequency and stool consistency”. The author warned that these data should be interpreted with caution due to the possibility of bias. [21]

Concerns regarding the effectiveness and safety of probiotics have been raised both in the media and scientific literature, which may have limited their use. [22] However, in paediatrics many studies have found that their safety should only be of concern in the small group of children who are at risk of experiencing an adverse event, such as those who are severely immuno-compromised. [13, 23] Probiotics are classified as a food product and so are not subjected to the same ‘manufacturing and quality control’ standards as medications. Results from stricter probiotic testing might allow clinicians to confidently and safely advise probiotics in this population. [24] They are not prescribable as they are sold under a food product license in the U.K.

The General Medical Council (G. M. C.) of the U.K. in its *Good Medical Practice [2013]* section 16f states that doctors should, ‘check that the care or treatment you provide for each patient is compatible with any other treatments the patient is receiving, including (where possible) self-prescribed over-the-counter medications.’ [25] Thus we feel doctors should be asking routinely about complementary medications including probiotics.

We wished to explore whether parents were using probiotics, what they knew about them and whether doctors asked routinely about probiotic usage in keeping with G. M. C. guidance. Given the probable benefits of reducing eczema prevalence in newborns, infectious and antibiotic induced diarrhoea and possible benefits in inflammatory bowel disease and irritable bowel syndrome, we wondered if families attending allergy and gastroenterology clinics used them more frequently.

4. Aims and Objectives

1. Determine the prevalence of probiotic use in children.
2. Evaluate parents’ knowledge and awareness on probiotic use in children.
3. Identify whether there is a difference in the data collected between those attending an allergy/gastroenterology clinic, and the remaining parents.

5. Methodology

This project was authorised by Cardiff University as a student specialist clinical service evaluation project not requiring formal ethical approval. The survey consisted of 9 questions which focused on probiotic use in children, alongside the awareness and knowledge of parents. The questionnaire questions and acceptable answer groups are shown in Table 1. This was presented to a convenience sample of parents in the inpatient and outpatient hospital departments. The questions were asked face to face by one observer with answers recorded anonymously on a tablet computer using the online survey tool KwikSurveys. [26] The purpose of the project was explained clearly to parents and their agreement to participate was obtained prior to completion of the survey. A pilot was conducted on ten parents to ascertain parental comprehension and whether the language was accessible, following which minor phrasing alterations were made. The final survey was then administered.

The majority of questions were designed to determine parental awareness, knowledge and opinions regarding probiotic use in children. These final questions and answer groups are shown below in the questionnaire in Table 1. Chi square testing was used to calculate odds ratios with a p value of < 0.05 taken as statistically significant.

Table 1. Questionnaire questions and acceptable answer groups.

Question No.	Question	Answer groups
1	What is the sex of your child?	Male; female
2	How old is your child?	<5; 5-10; 11-18 years
3	Why has your child come to the hospital today?	Allergy Clinic; Gastroenterology Clinic; Other paediatric clinics; Inpatient
4	Do you know what probiotics are?	Yes; No
5	Can you think of any reasons for giving probiotics to children?	Answer had to include understanding of a "germ" taken to produce health benefit.
	Do you think probiotics help to:	
	a) improve children's general health?	
	b) reduce the risk of eczema in newborn babies?	
6	c) prevent minor infections?	Yes; No; I don't know
	d) treat tummy bugs?	
	e) reduce antibiotic associated diarrhoea?	
	f) lessen irritable bowel syndrome?	
7	Which of these best describes your views on probiotics:	They can improve a child's health; They have no effect on a child's health; They are bad for a child's health; I don't know
8	Have you ever given your child probiotics?	Yes; No
9	Has a healthcare professional, such as your doctor or nurse, ever asked if you have given your child probiotics or recommended them?	Asked if given; Recommended

6. Results

A total of 326 families were approached to participate. Surveys were excluded in 19 families who were called into clinic before completion. Only three parents decided not to take part. Thus 304 parents completed the survey; 150 boys and 154 girls. The ages of the children were fairly evenly spread; 35.2% (107/304) were under 5, 31.3% (95/304) were 5-10 and 33.6%

(102/304) were 11-18 years old. The study included 37 inpatients, 21 attending the allergy clinic, 46 gastroenterology clinic patients and 200 general paediatric clinic patients. Overall, 53.6% (163/304) were able to explain what probiotics were and 75.3% (229/304) thought that they could improve a child's health. Those attending allergy/gastroenterology clinics had a higher knowledge 64.2% (43/67) compared to all other parents, 50.6% (120/237) (OR 1.75; 95% CI 1.00, 3.06). (Table 2).

Table 2. Proportion of parents who knew what probiotics were in the allergy/gastroenterology group, compared with the inpatient/other group.

Allergy/Gastroenterology		Inpatient/Other		Odds Ratio	95% CI	P Value
Yes	No/Unsure	Yes	No/Unsure			
43 (64.5%)	24 (35.8%)	120 (50.6%)	117 (49.4%)	1.75	1.00, 3.06	0.049

When asked to provide a reason for giving probiotics to children, 50.7% of the parents attending allergy/gastroenterology clinics were able to, compared with

34.6% in the inpatient/other group (OR 1.95; 95% CI 1.13, 3.37) (Table 3). Common phrases used included "good gut health", "better immune system".

Table 3. Proportion of parents who could correctly suggest a reason for use of probiotics in the allergy/gastroenterology group, compared with the inpatient/other group.

Allergy/Gastroenterology		Inpatient/Other		Odds Ratio	95% CI	P Value
Correct answer	Incorrect answer/no response	Correct answer	Incorrect answer/no response			
34 (50.7%)	33 (49.3%)	82 (34.6%)	155 (65.4%)	1.95	1.13, 3.37	0.016

Table 4. Number (and percentage) of parents who believed probiotic use would benefit these indications by group.

Question	All respondents Number (%)		Allergy/ Gastroenterology		General Paediatric, Inpatient and all Others		Odds Ratio comparing Allergy/GI clinic to all General Paediatric and other respondents		
	Yes	No/ Unsure	Yes	No/ Unsure	Yes	No/ Unsure	O. R.	95% CI	p Value
Improve children's general health	170 (55.9)	134 (44.1)	41 (61.2)	26 (38.8)	129 (54.4)	108 (45.6)	1.32	0.76, 2.30	0.320
Reduce eczema in newborns	88 (28.9)	216 (71.1)	30 (44.8)	37 (55.2)	58 (24.5)	179 (75.5)	2.50	1.42, 4.40	0.001
Prevent minor infections	117 (38.5)	187 (61.5)	29 (43.3)	38 (56.7)	88 (37.1)	149 (62.9)	1.29	0.75, 2.24	0.360
Treat tummy bugs	122 (40.1)	182 (59.9)	32 (47.8)	35 (52.2)	90 (38.0)	147 (62.0)	1.49	0.86, 2.58	0.150
Reduce antibiotic associated diarrhoea	136 (44.7)	168 (55.3)	40 (59.7)	27 (40.3)	96 (40.5)	141 (59.5)	2.18	1.25, 3.78	0.005
Lessen irritable bowel syndrome	103 (33.9)	201 (66.1)	30 (44.8)	37 (55.2)	73 (30.8)	164 (69.2)	1.82	1.05, 3.17	0.030

The allergy/gastroenterology group were more likely to agree that probiotics could produce specific benefits namely:

reduce the risk of eczema in newborn babies (OR 2.50; 95% CI 1.42, 4.40); reduce antibiotic associated diarrhoea (OR 2.18; 95% CI 1.25, 3.78) and lessen irritable bowel syndrome (OR 1.82; 95% CI 1.05, 3.17). These findings are summarised in Table 4.

Overall three quarters (75%) of all parents felt that probiotics could improve a child's health (Table 5). No participants felt that they could harm a child's health. Around a half of all participants, 53.3% (162/304) had given their

child probiotics, with modestly higher rates in the allergy/gastroenterology cohort, 64.2% (43/67) compared to those in the general paediatric/inpatient/other cohort 50.2% (119/237); (OR 1.78; 95% CI 1.01, 3.12) (Table 6). Those in the allergy/gastroenterology group were more than twice as likely to be able to name a brand than the inpatient/other group (OR 2.18; 95% CI 1.25, 3.78) (Table 7). Some of the most commonly mentioned brands included "Actimel" and "Yakult".

Table 5. Proportion of parents who thought that probiotics can improve a child's health in the allergy/gastroenterology group, compared with the inpatient/other group.

Allergy and Gastroenterology		Inpatient and other		Odds Ratio	95% CI	P Value
They can improve a child's health	They have no effect/I don't know	They can improve a child's health	They have no effect/I don't know			
51 (76.1%)	16 (23.9%)	178 (75.1%)	59 (24.9%)	1.06	0.56, 1.99	NS 0.862

Table 6. Proportion of parents who had given their child probiotics in the allergy/gastroenterology group, compared with the inpatient/other group.

Allergy/Gastroenterology		Inpatient/Other		Odds Ratio	95% CI	P Value
Yes	No	Yes	No			
43 (64.2%)	24 (35.8%)	119 (50.2%)	118 (49.8%)	1.78	1.01, 3.12	0.046

Table 7. Proportion of parents who could suggest a brand in the allergy/gastroenterology group, compared with the inpatient/other group.

Allergy/Gastroenterology		Inpatient/Other		Odds Ratio	95% CI	P Value
Brand suggested	Brand not suggested	Brand suggested	Brand not suggested			
40 (59.6%)	27 (40.4%)	96 (40.5%)	141 (59.5%)	2.18	1.25, 3.78	0.005

Only 8.9% (27/304) of doctors enquired about probiotics and 12.2% (37/304) recommended them. Table 8 shows that healthcare professionals were more than twice as likely to have recommended probiotics to parents in the allergy/gastroenterology group than the other parents in the study (OR 2.82; 95% CI 1.37, 5.81).

Table 8. Proportion of parents who could recall a healthcare professional asking if they had ever given probiotics to their child, and if a healthcare professional had ever recommended probiotics to them.

	Allergy/Gastroenterology		Inpatient/Other		Odds Ratio	95% CI	P Value
	Yes	No	Yes	No			
Given	11 (16.4%)	56 (83.6%)	16 (6.8%)	221 (93.2%)	2.71	1.19, 6.17	0.014
Recommended	15 (22.4%)	52 (77.6%)	22 (9.3%)	215 (90.7%)	2.82	1.37, 5.81	0.004

7. Discussion

There have been no studies to date which have explored parental perspectives regarding probiotics across the whole spectrum of childhood, rather than just neonatally. [27-29] Some studies have explored the opinions of patients with gastrointestinal pathology in adult populations. [30, 31] The results of our survey show that parental awareness of what probiotics are is reasonable. They were viewed positively by parents who had no concerns about their safety.

Over half (53.9%) of parents had given probiotics to their children. Results from two similar studies found that 50% and 51% of children in their study populations had used probiotics. [28, 29] Another important finding was that parents attending an allergy/ gastroenterology clinic were more likely to give their child probiotics than other parents.

Most believed they have general health benefits; although there are insufficient data to support this view. However there exist specific health benefits for particular probiotic species. Despite these facts, most families believed probiotics could

improve overall "general health", more than their other proven benefits. These findings may possibly be attributed to commercial advertisements or internet selling or biased social media feeds [32] which our data cannot explain.

Knowledge about the clinical uses of probiotics was higher among parents attending an allergy/gastroenterology clinic than the other parents who took part in the study. Furthermore, they were more likely to suggest a reason for probiotic use and be able to suggest a brand that they gave to their child. There are many reasons why knowledge of probiotics could be higher among those attending allergy/gastroenterology clinics. Probiotics are more useful for conditions in these groups - they have been proven to reduce eczema in newborns and treat gastroenteritis [8-11]. Thus, parents with children with these and similar conditions (allergic and gastrointestinal) may be more aware of probiotics. Control of any chronic condition is difficult to achieve and maintain, even when treated maximally using medical therapy. This is particularly the case for conditions where the aetiology is only partially known, such as irritable bowel syndrome and inflammatory bowel disease. As a result, parents of children with gastrointestinal

pathology may be more likely to explore alternative therapies which could benefit their child. [28] An isolated cross-sectional study found that use of complementary therapies is three times more likely in children with inflammatory bowel disease or cerebral palsy, than in healthy children. [33]

Despite the G. M. C. recommendation that doctors should enquire about standard and complimentary medicines, we found that only 8.9% enquired about probiotic use. Similar findings were reported in a cross-sectional study investigating the use of complementary medicine in children attending gastroenterology clinics; 24% of parents had not discussed their decision with a doctor. [28] Given their modest, selective health benefits, targeted use of probiotics in selective cases may be beneficial for children's health. Doctors in the allergy and gastroenterology clinics and those treating infectious diarrhoea may be best placed to utilise these benefits. These products are not medications which gives some practical difficulties as to how patients source them and where from. Many products sold in health food shops have no proven benefit and so it is important to source a reliable high quality brand.

There were limitations to this evaluation. The results were collected from a convenience sample of parents visiting a hospital and random stratification was not employed. This means that the results may be less likely to be representative of the general population. A larger sample size would yield more reliable results.

8. Conclusion

Despite some unsupported views about probiotics leading to a general health improvement, parental awareness and knowledge about probiotics was otherwise reasonable. There was a higher level of familiarity in the cohort attending an allergy or gastroenterology clinic, compared with the other participants. These children were also more likely to have received probiotics. Despite the G. M. C. guidance recommending a full prescribed and complimentary medical history be taken, few doctors appear to have enquired about the use of these products. There may be benefit from more paediatricians using selective high-quality probiotics for certain proven indications. Families are frequently using probiotics, doctors need to be aware of them and their potential effects on a child's health and treatments.

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References

- [1] Reid G. Probiotics: definition, scope and mechanisms of action. *Best practice & research Clinical gastroenterology*. 2016; 30 (1): 17-25.

- [2] Cremon C, Barbaro MR, Ventura M, Barbara G. Pre-and probiotic overview. *Current opinion in pharmacology*. 2018; 43: 87-92.
- [3] Islam SU. Clinical uses of probiotics. *Medicine*. 2016; 95 (5).
- [4] Life Go. Kids' Microbiomes.; 2021 (accessed 25th January 2021). Available from: https://www.gardenoflife.co.uk/microbiomes/kids-microbiome-s.list?gclid=EAIaIQobChMI96LRxdmU7gIVj7PtCh0nigv4EAAYASAAEgIjrvD_BwE&gclid=aw.ds.
- [5] Laboratories W. Probiotics for Kids. 2021 (accessed 25th January 2021). Available from: <https://www.optibacprobiotics.com/uk/learning-lab/in-depth/childrens-health/probiotics-for-kids>.
- [6] Symprove. The Symprove Journey. 2021 (accessed 25th January 2021). Available from: https://www.symprove.com/pages/journey?gclid=EAIaIQobChMI96LRxdmU7gIVj7PtCh0nigv4EAAYAiAAEgLM9vD_BwE.
- [7] Szajewska H. What are the indications for using probiotics in children? *Archives of disease in childhood*. 2016; 101 (4): 398-403.
- [8] Kuitunen M, Boyle RJ. Probiotics for the prevention of allergic disease. *Clin Exp Allergy*. 2012; 42 (7): 991-3. doi: <https://dx.doi.org/10.1111/j.1365-2222.2012.04023.x>.
- [9] West CE, Dzidic M, Prescott SL, Jenmalm MC. Bugging allergy; role of pre-, pro-and synbiotics in allergy prevention. *Allergology International*. 2017; 66 (4): 529-38.
- [10] Szajewska H, Guarino A, Hojsak I, Indrio F, Kolacek S, Shamir R, et al. Use of probiotics for management of acute gastroenteritis: a position paper by the ESPGHAN Working Group for Probiotics and Prebiotics. *Journal of Pediatric Gastroenterology and Nutrition*. 2014; 58 (4): 531-9.
- [11] Guarino A, Ashkenazi S, Gendrel D, Vecchio AL, Shamir R, Szajewska H. European Society for Pediatric Gastroenterology, Hepatology, and Nutrition/European Society for Pediatric Infectious Diseases evidence-based guidelines for the management of acute gastroenteritis in children in Europe: update 2014. *Journal of pediatric gastroenterology and nutrition*. 2014; 59 (1): 132-52.
- [12] Hao Q, Dong BR, Wu T. Probiotics for preventing acute upper respiratory tract infections. *Cochrane Database of Systematic Reviews*. 2015 (2).
- [13] Goldenberg JZ, Lytvyn L, Steurich J, Parkin P, Mahant S, Johnston BC. Probiotics for the prevention of pediatric antibiotic-associated diarrhea. *Cochrane Database of Systematic Reviews*. 2015 (12).
- [14] Szajewska H, Canani RB, Guarino A, Hojsak I, Indrio F, Kolacek S, et al. Probiotics for the prevention of antibiotic-associated diarrhea in children. *Journal of pediatric gastroenterology and nutrition*. 2016; 62 (3): 495-506.
- [15] Robertson C, Savva GM, Clapuci R, Jones J, Maimouni H, Brown E, et al. Incidence of necrotising enterocolitis before and after introducing routine prophylactic Lactobacillus and Bifidobacterium probiotics. *Archives of Disease in Childhood-Fetal and Neonatal Edition*. 2020; 105 (4): 380-6.
- [16] Sharif S, Meader N, Oddie SJ, Rojas-Reyes MX, McGuire W. Probiotics to prevent necrotising enterocolitis in very preterm or very low birth weight infants. *Cochrane Database of Systematic Reviews*. 2020 (10).

- [17] Didari T, Mozaffari S, Nikfar S, Abdollahi M. Effectiveness of probiotics in irritable bowel syndrome: Updated systematic review with meta-analysis. *World journal of gastroenterology: WJG*. 2015; 21 (10): 3072.
- [18] Korterink JJ, Ockeloen L, Benninga MA, Tabbers MM, Hilbink M, Deckers-Kocken JM. Probiotics for childhood functional gastrointestinal disorders: a systematic review and meta-analysis. *Acta Paediatrica*. 2014; 103 (4): 365-72.
- [19] Parker EA, Roy T, D'Adamo CR, Wieland LS. Probiotics and gastrointestinal conditions: An overview of evidence from the Cochrane Collaboration. *Nutrition*. 2018; 45: 125-34. e11.
- [20] Koretz RL. Probiotics in gastroenterology: how pro is the evidence in adults? *American Journal of Gastroenterology*. 2018; 113 (8): 1125-36.
- [21] Dimidi E, Christodoulides S, Fragkos KC, Scott SM, Whelan K. The effect of probiotics on functional constipation in adults: a systematic review and meta-analysis of randomized controlled trials. *The American journal of clinical nutrition*. 2014; 100 (4): 1075-84.
- [22] Boyle RJ, Robins-Browne RM, Tang ML. Probiotic use in clinical practice: what are the risks? *The American journal of clinical nutrition*. 2006; 83 (6): 1256-64.
- [23] Doron S, Snyderman DR. Risk and safety of probiotics. *Clinical Infectious Diseases*. 2015; 60 (suppl_2): S129-S34.
- [24] Sanders ME, Merenstein DJ, Ouwehand AC, Reid G, Salminen S, Cabana MD, et al. Probiotic use in at-risk populations. *Journal of the American Pharmacists Association*. 2016; 56 (6): 680-6.
- [25] Council GM. Good Medical Practice 2013 (accessed 25th January 2021). Available from: https://www.gmc-uk.org/-/media/documents/good-medical-practice---english-20200128_pdf-51527435.pdf?la=en&hash=D A1263358CCA88F298785FE2BD7610EB4EE9A530.
- [26] KwikSurveys. 2001 (accessed 19th April 2019). Available from: <https://kwiksurveys.com/>.
- [27] Sesham R, Oddie S, Embleton ND, Clarke P. Probiotics for preterm neonates: parents' perspectives and present prevalence. *Archives of Disease in Childhood-Fetal and Neonatal Edition*. 2014; 99 (4): F345-F.
- [28] Wadhwa V, Lemberg DA, Leach ST, Day AS. Complementary and alternative medicine in children attending gastroenterology clinics: usage patterns and reasons for use. *Journal of paediatrics and child health*. 2011; 47 (12): 904-10.
- [29] Bridgman SL, Azad MB, Field CJ, Letourneau N, Johnston DW, Kaplan BJ, et al. Maternal perspectives on the use of probiotics in infants: a cross-sectional survey. *BMC complementary and alternative medicine*. 2014; 14 (1): 366.
- [30] Harrison KL, Farrell RM, Brinich MA, Highland J, Mercer M, McCormick JB, et al. 'Someone should oversee it': patient perspectives on the ethical issues arising with the regulation of probiotics. *Health Expectations*. 2015; 18 (2): 250-61.
- [31] Mercer M, Brinich MA, Geller G, Harrison K, Highland J, James K, et al. How patients view probiotics: findings from a multicenter study of patients with inflammatory bowel disease and irritable bowel syndrome. *Journal of clinical gastroenterology*. 2012; 46 (2): 138.
- [32] Brinich MA, Mercer MB, Sharp RR. An analysis of online messages about probiotics. *BMC gastroenterology*. 2013; 13 (1): 5.
- [33] McCann L, Newell S. Survey of paediatric complementary and alternative medicine use in health and chronic illness. *Archives of disease in childhood*. 2006; 91 (2): 173-4.