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TARGet Kids! collaboration

Abstract

Background: Parent and physician perceptions of plant milk are unclear. **Aim:** To explore parent and physician perceptions of plant milk for children and to gain a better understanding of why parents and physicians might choose plant milk for children. **Methods:** A mixed methods study was conducted using a questionnaire and interviews with parents and physicians participating in the TARGet Kids! cohort study. Questionnaire data were analyzed using descriptive statistics. Interview transcripts were analyzed using thematic analysis. **Results:** Parents reported a variety of reasons for choosing plant milk for their children including concerns around allergies, the environment, animal welfare, plant-based diet, health benefits, taste and hormones in cow's milk. Parents gave their children various types of plant milks and physicians provided various recommendations to parents of children not consuming cow's milk. Our study identified that 79% of parents and 51% of physicians were unaware that soy milk is the recommended cow's milk substitute for children. Additionally, 26% of parents did not know some plant milks are not fortified and can contain added sugar. Three main themes were identified from interviews about why parents and physicians may choose plant milk for children: (i) healthiness of plant milk; (ii) concerns about hormones; and (iii) environmental impacts. **Conclusions:** Parents and physicians choose the milk that they believe is healthiest for their child or patient. However, a lack of clarity on the effects of plant milk consumption on children's health resulted in conflicting views on whether plant milk or cow's milk is healthier for children.

Keywords

Plant milk, cow's milk, soy, oat, almond, children, parents, physicians

Introduction

Consumption of plant milk beverages, such as soy and almond milk, is becoming increasingly popular among

children (Sethi et al., 2016; Merritt et al., 2020). A recent study by our group found that 13% of parents reported providing plant milks to their children (Morency et al., 2017). The nutritional benefits of childhood plant milk

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consumption are unclear (Wheeler and Chapman-Novakofski, 2014; Craig and Fresan, 2021; Sousa and Kopf-Bolan, 2017). Plant milks are lower in energy and saturated fat content than cow's milk, which may help children maintain a healthy body weight and reduce serum lipids which have been associated with cardiovascular disease in adulthood (Vanga and Raghavan, 2018; Jenkins et al., 2019). However, plant milks are also generally lower in protein and non-fortified plant milks lack essential micronutrients such as calcium and vitamin D present in cow's milk (Vanga and Raghavan, 2018; Singhal et al., 2017). Fortified soy milk is comparable to cow's milk in macro and micronutrient content and is the only plant milk that is currently recommended as a substitute to cow's milk for children (Lott et al., 2019; Health Canada, 2019).

In response to the rising trend of plant milk consumption in children, the American Academy of Pediatrics, Academy of Nutrition and Dietetics, American Heart Association and American Academy of Pediatric Dentistry issued a joint statement in 2019 cautioning against the use of plant milks (except soy milk) in early childhood (Lott et al., 2019). However, these guidelines are based on limited evidence, and recently published viewpoints and commentaries have emphasized the need for further research on this topic (Bodnar et al., 2021; Wright and Smith, 2020). In their commentary, Wright and Smith (2020) argued that the new guidelines go beyond what the available evidence supports and suggest a potential bias towards cow's milk, while failing to acknowledge the benefits of plant milks for children.

Lack of clarity surrounding the healthiness of plant milks for children may contribute to parental confusion about what milk to offer their children. Therefore, the aim of our study was to explore parents' perceptions and knowledge about plant milks and the reasons they might choose these beverages over cow's milk for their children. In addition, since parents often rely on primary care physicians as a trusted source of nutritional information for their children (Vanderhout et al., 2019), we also aimed to understand physicians' views on plant milks for children and the recommendations that they provide to parents about these beverages.

Methods

Study design and participants

A mixed methods study was conducted involving physicians and parents of children enrolled in TARGet Kids!, a practice-based research network in Canada (Carsley et al., 2015). Children were recruited from pediatric and family medicine practices in Toronto during a routine primary healthcare visit. The research network leverages the unique relationship between parents, children and their primary care physician to conduct research that is aligned with the needs of families.

Quantitative component

A purposive sample of parents and primary care physicians was contacted via email inviting them to participate in the study with a link to the questionnaire. To ensure that we captured a wide range of perspectives on the topic, parents known to provide plant milk or cow's milk to their children were purposely selected for the study. Eligible parents were identified based on their past responses to a TARGet Kids! nutrition questionnaire about their child's milk consumption. The questionnaire was pilot tested by two content experts, a pediatrician (JLM) and a qualitative researcher (CJH). Feedback was used to modify the wording and order of some of the questions.

Qualitative component

Semi-structured interviews were conducted with a subset of parents and physicians to understand the rationale behind the questionnaire responses and to explore the topic in more detail. After parents and physicians completed the questionnaire, they were invited to participate in an individual interview. Interviews were conducted until data saturation was reached, involving a minimum of 12 parents and 12 physicians (Julious, 2005; Guest et al., 2006). A semi-structured interview guide was developed by the researchers and consisted of pre-determined questions. The interview script was flexible to allow the interviewer to ask follow-up questions, seek clarification on a topic raised and to encourage participants to elaborate on their responses. The first author (IS) who is a registered dietitian with prior training in counselling and communication skills conducted all the interviews between October 2019 and March 2020. All interviews were conducted over the telephone and were 15–20 min in duration.

Data analysis

Descriptive statistics including means and proportions were used to describe the questionnaire data. Interviews were audio-recorded, transcribed verbatim, de-identified and checked against the original audio recordings to ensure accuracy. Parent and physician transcripts were analyzed separately using an inductive approach to thematic analysis (Braun and Clarke, 2006). As described by Braun and Clarke, the analysis of the interviews included several sequential steps. The researcher first read and re-read all the interview transcripts making note of any patterns in the data. After becoming familiar with the data, the interview transcripts were coded and a list of initial codes was generated. Codes with similar meanings were organized hierarchically into categories and grouped to identify potential themes. A subset of the research team (IS, JLM and CJP) then reviewed and refined the initial themes, and through discussion, identified and named the final themes. Triangulation of researchers (IS and CJP)

Table 1. Characteristics of parents and physicians who completed the questionnaire¹.

	(n = 43)		Plant milk (n = 26)		Cow's milk (n = 17)	
	n	(%)	n	(%)	n	(%)
Parent characteristics						
Female gender	38	(88)	22	(85)	16	(94)
Parent age (mean $\pm$ SD)	39	($\pm$ 5.0)	41	($\pm$ 4.4)	36	($\pm$ 4.6)
<35 years	9	(21)	2	(8)	7	(41)
35–39 years	13	(30)	6	(23)	7	(41)
$\geq$ 40 years	21	(49)	18	(69)	3	(18)
Number of children						
1	16	(37)	7	(27)	9	(53)
2	20	(47)	13	(50)	7	(41)
3+	7	(16)	6	(23)	1	(6)
Child age in years (mean $\pm$ SD)	4.7	($\pm$ 2.4)	5.5	($\pm$ 2.4)	3.3	($\pm$ 1.9)
Physician characteristics						
	All (n = 41)					
Number of years in practice						
Less than 5 years	15	(37)				
Between 5 and 10 years	10	(24)				
10 years or more	16	(39)				

¹Data are presented as frequency counts (n) and percentages (%) unless otherwise indicated.

was used to improve the reliability and the interpretation of the results. Interview transcripts were analyzed with the support of the qualitative data analysis software NVivo[®] version 12.

Quantitative results

A total of 120 parents and 70 physicians were invited to participate in the questionnaire, of whom 43 parents and 41 physicians responded. The majority of physicians (63%) had been practicing medicine for at least 5 years. Parents were mostly female (88%) and ranged in age from 27 to 52 years, with a mean age of 39 ($\pm$ 5.0) years. Nearly half (47%) of the parents had two children, 37% had one child and 16% had three or more children. The mean age of their children was 4.7 ($\pm$ 2.4) years. Within our sample, parents who provided plant milk versus cow's milk to their child were on average older (41 vs. 36 years) (Table 1).

Practices around child plant milk consumption

Among the parents who completed the questionnaire (n = 43), 26 reported providing plant milk to their child, either as a replacement for cow's milk (n = 21) or in addition to cow's milk (n = 5). The remaining 17 parents reported providing cow's milk to their child. Parents offered various types of plant milks to their child including oat (n = 15), almond (n = 11), soy (n = 11), cashew (n = 5), coconut (n = 5), rice (n = 4), hemp (n = 2) and pea protein (n = 1).

Among the physicians who completed the questionnaire (n = 41), 27 routinely provided plant milk recommendations to parents of children aged 2 years and older not consuming cow's milk. Of these, 14 physicians recommended fortified plant milk for children, 11 recommended fortified

soy milk and 2 recommended a soy-based commercial formula. The remaining 14 physicians did not provide any recommendations.

Reasons parents choose plant milk for their children

The majority of parents (n = 13; 50%) reported choosing plant milk for their child because of an allergy or intolerance to cow's milk. Other reasons included environmental concerns (n = 12; 46%), plant-based diet (n = 11; 42%), animal welfare (n = 10; 38%), health benefits (n = 10; 38%), taste preference (n = 6; 23%) and concerns about hormones in cow's milk (n = 5; 19%) (Figure 1).

Knowledge of plant milk among parents and physicians

Most parents (n = 32; 74%) and physicians (n = 36; 88%) were aware that fortification of plant milks can vary between brands. Many parents (n = 32; 74%) and physicians (n = 30; 73%) also knew that plant milks can contain added sugar. Less than one quarter of parents (n = 9; 21%) and half of physicians (n = 20; 49%) knew that fortified soy milk is the preferred substitute to cow's milk for children. Less than half of parents (n = 18; 42%) and half of physicians (n = 21; 51%) were aware that soy milk contains a similar amount of protein as cow's milk (Table 2).

Qualitative results

Interviews were conducted with 12 parents (11 mothers and 1 father) and 12 physicians (9 females and 3 males) when data saturation was reached. Four of the physicians were pediatricians and the rest were family physicians.

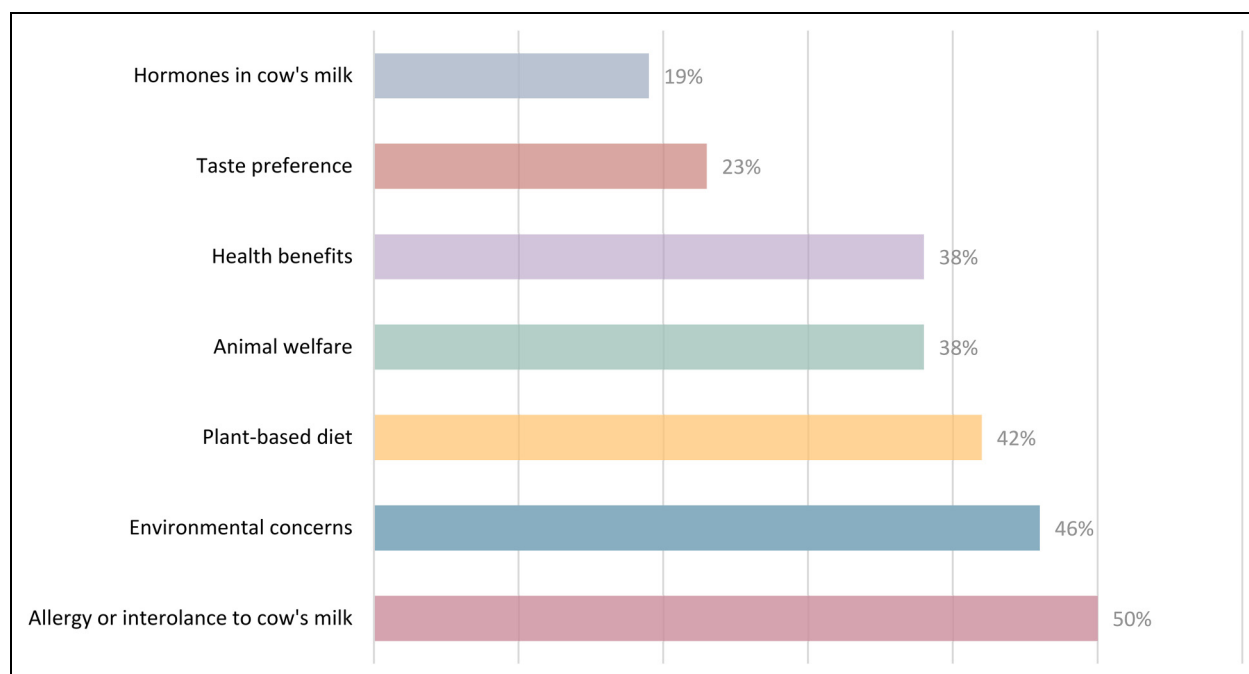


Figure 1. Reasons parents choose plant milks for their children ($n = 26$).

Table 2. Knowledge of plant milks among parents and physicians who completed questionnaire.

Statement	Number (%) that answered correctly ^{1,2}	
	Parents ($n = 43$)	Physicians ($n = 41$)
Fortification of plant milks can vary between brands	32 (74%)	36 (88%)
Some plant milks can contain added sugar	32 (74%)	30 (73%)
Soy milk is the preferred cow's milk substitute for children ≥ 2 years	9 (21%)	20 (49%)
Soy milk contains a similar amount of protein as cow's milk	18 (42%)	21 (51%)

¹Data represent the number (and percentage) of parents or physicians who answered correctly to each of the statements.

²Percentages were calculated as the number of correct responses/ the number of respondents.

Through thematic analysis three themes were identified about why parents and physicians may choose plant milk for children: (i) healthiness of plant milk; (ii) concerns about hormones; and (iii) environmental impacts.

Healthiness of plant milk

Parents who provided plant milks to their children stated that consuming less animal products and more plant-based foods may offer health benefits and, therefore, considered plant milks to be healthier than cow's milk for children.

These parents also thought that cow's milk was not necessary in children's diets as other foods, such as plant milks, can provide the same nutrients:

'I think that there's a real awareness now of the lack of requirement of cow's milk. There are phenomenal options now' – *Parent*

'I don't think cow's milk is necessary. There are so many other ways to get the same nutrients in our diet nowadays.' – *Parent*

Other parents considered plant milks *less* healthy than cow's milk for children due to their lower nutritional content:

'Plant milks are low calorie and protein so they don't seem to serve the same purpose as cow's milk' – *Parent*

'I think a varied diet is always good, like to not drink only one thing, so I can see the benefits of plant milks but I just think cow's milk is healthier in general' – *Parent*

Many parents expressed concern about the amount of preservatives, additives and sugar in some plant milks, and viewed them as processed products:

'I'm concerned how they process these things, how much extra sugar they add or strange things to make it thick. Even if it's plant-based, it doesn't really sound so natural to me'. – *Parent*

'Maybe plant milks are healthier because they don't have the fat that is in cow's milk, but I think the fat in cow's milk is better

than the sugar, preservatives and additives in plant milk.’ – *Parent*

‘I just feel like all the other milks are kind of processed. I mean, sure, maybe cow’s milk is processed too, but it just feels like plant milks have gone through some kind of machine processing or something to get there.’ – *Parent*

Parents who preferred plant milks were also concerned about preservatives and sugar in some plant milks and tried to choose products that had minimal amounts of these ingredients:

‘There are certain brands that I like because they have fewer additives’ – *Parent*

‘More recently I’ve started buying pea protein milk because it has more protein and less sugar than some of the other brands I buy.’ – *Parent*

Physicians considered plant milks a good option for children who cannot consume cow’s milk (e.g., because of an allergy) but considered cow’s milk healthier for most children. One physician, for instance, stated: ‘For some kids, plant milks make sense!’ Physicians’ main concern was that parents may overestimate the healthiness of plant milks because they associate plant-based with being healthier, and may not realize that some of these products are not fortified and may contain high amounts of sugar:

‘There’s a lot of misinformation as plant-based being automatically healthier but many of these alternative milks have high sugar content and some are not fortified.’ – *Physician*

‘I’m just not confident yet that we know whether it’s healthy or not, or that they’re getting everything they need, or that they’re fortified in the right way’. – *Physician*

Physicians were aware that plant milks can vary in nutritional content and that some products may be healthier than others (e.g., depending on the source of the plant, whether it is fortified, how much sugar it contains):

‘I think there are plant milks that could be adequate alternatives to cow’s milk, but it really depends on the brand and what it contains, because some of the alternative milks have high sugar content and some are not fortified.’ – *Physician*

Concerns about hormones

Many parents were concerned about hormones in cow’s milk, and the effect this could have on their child’s health:

‘I’ve listened to a lot of different podcasts and I don’t think cows are necessarily healthy and might have hormones injected in them, which would then get into the milk. So, I’m starting to question *how* healthy cow’s milk is for my kids.’ – *Parent*

One parent stated that it is unnatural to drink the milk of other animals:

‘I think there’s a lot more education and information available in terms of what is better for us as humans and I just don’t feel that we should be drinking another animal’s milk, you know, in terms of growth hormones that’s in the milk.’ – *Parent*

A few parents reported providing only organic cow’s milk to their child to reduce their exposure to hormones:

‘We give organic cow’s milk to our kids because of the hormones that are in dairy. That’s a major concern of mine – that a lot of cows are exposed to hormones.’ – *Parent*

Parents were equally concerned about hormones in soy milk. For example, one parent stated that consumption of soy milk may increase estrogen levels in boys:

‘I’ve heard that soy milk has a high amount of estrogen so it might not be ideal to give to a little boy.’ – *Parent*

Physicians did not share parents’ concerns about hormones in milk beverages. For example, when asked about phytoestrogens in soy milk, one physician stated:

‘I have had questions about soy and the potential estrogen before from parents but that’s all been completely debunked so I always reassure parents that it’s not going to give their 2 year-old boy extra estrogen.’ – *Physician*

Physicians stated that organic cow’s milk is not any healthier for children than conventional cow’s milk and expressed concern about misleading health claims, such as ‘hormone-free’ on organic cow’s milk, which could confuse parents when making milk choices:

‘I think the way these products are marketed is a problem because the organic ones will say hormone-free, so people are under the impression that the alternative, the non-organic, is not hormone-free. It’s just a marketing ploy. There are standards in Canada and there’s no added hormones in any cow’s milk.’ – *Physician*

Environmental impact of milk choice

Regardless of their milk preference, most parents were concerned about the environmental impact of cow’s milk consumption:

‘I assume that there’s nutritional value to cow’s milk and that’s why they tell you to give it to your kid *but* cow’s milk

[production] is not good for the environment and it's not good for the cows.' – *Parent*

Although most parents considered the environmental impact of their milk choices, some said they would not choose plant milk over cow's milk if it was less healthy for their child, *even* if it was better for the environment:

'If I had to choose between the environment or my child's health, I would choose my son's health.' – *Parent*

'I do consider the environment, but when it comes the nutritional requirements of my kid, that sort of triumphs everything.' – *Parent*

Similar to parents, physicians considered plant milks better than cow's milk in terms of environmental impact, but would not recommend plant milk to their patients if it was a less healthy option:

'I think in general the move towards more plant protein and away from animal products, whether it's cow's milk or meat, is a good thing from a planetary health perspective to mitigate climate change, but I would not extend that recommendation to children yet until I know what the implications are.' – *Physician*

'When it comes to counselling my adult patients, I have no issues around substituting plant milks, such as soy milk, for cow's milk. I will say with kids, I'm much happier to just wait and follow the guidance of pediatricians I work with or the Canadian Pediatric Society, only because, you know, *they're kids!*' – *Physician*

Discussion

Our study identified parents' and physicians' perceptions about plant milks for children. The quantitative component of the study showed that parents choose plant milk for their children for a variety of reasons including allergies, animal welfare, dietary preference, environmental concerns and health benefits. Many parents (79%) and half of physicians (51%) were not aware that soy milk is the only plant milk recommended for children as a replacement for cow's milk (Lott et al., 2019). Some parents (26%) were also not aware of the lower micronutrient and high sugar content of many plant milk products. Three main themes were identified from interviews, which increased our understanding of parents' and physicians' perceptions of plant milks in children's diets: (i) healthiness of plant milk; (ii) concerns about hormones; and (iii) environmental impacts.

Our study found that some parents consider plant milk healthier than cow's milk for children. Previous studies among parents of young children have identified similar views (Fifi et al., 2022; Laila et al., 2021). For example, Laila et al. found that parents choose plant milks for their

children because of perceived health benefits, which is consistent with our findings. The belief that plant milks are healthier than cow's milk may stem from dietary guidelines that promote plant-based foods and recommend limiting the intake of animal and full-fat dairy products for optimal health (Health Canada., 2019; U.S. Department of Agriculture and U.S. Department of Health and Human Services, 2020). A Canadian longitudinal study has shown that children who consume cow's milk with higher fat content have higher serum cholesterol levels (Wong et al., 2019), suggesting that one potential benefit of plant milks could be lowering children's cholesterol levels by displacing the saturated fat in cow's milk. Observational studies which examine the relationship between plant milk consumption and children's growth, nutrition and cardiovascular disease risk factors are needed to help clarify the potential advantages and disadvantages associated with the consumption of these beverages during childhood.

Other parents and physicians thought plant milks were not as healthy for children as cow's milk due to their lower nutrient content. Although plant milks can be fortified with nutrients (commonly calcium, vitamin D and B₁₂) to make them nutritionally closer to cow's milk, not all of them are. In Canada and the United States, fortification of plant milks is not regulated (Health Canada, 2022; Drewnowski et al., 2021). This lack of regulation means that plant milks can vary widely in micronutrient content by type and brand (Singhal et al., 2017). A Canadian cross-sectional study found that children aged 1–6 years who consumed plant milks had lower serum vitamin D levels compared to children who consumed cow's milk (Lee et al., 2014). This study underscores the need for improved parental education on how to read and interpret nutrition labels to ensure that fortified plant milks are being chosen by parents. Removing the word 'milk' from the label of plant milk beverages could help avoid potential confusion among parents who may mistakenly assume that these beverages are nutritionally equivalent to cow's milk. Alternatively, non-fortified plant milks could include a front-of-package warning (e.g., 'contains lower amounts of calcium and vitamin D than cow's milk') to help parents make informed decisions (Franco-Arellano et al., 2020).

Another concern about plant milks among physicians and parents was the high sugar content of some of these beverages. The American Heart Association recommends that children aged 2 years and older limit their intake of added sugar to less than six teaspoons per day (Vos et al., 2017). A single cup of sweetened plant milk can contain up to 20 grams (5 teaspoons) of added sugar (Bridges, 2018), which is over 80% of a child's daily recommended intake of added sugar (Vos et al., 2017). In comparison, cow's milk contains 12 grams of naturally occurring sugar lactose, which differs from the sugar found in some plant milk products that are added during processing to make the product sweeter without contributing any nutritional value to children's diet (Bridges, 2018). Fortunately, many plant milks come in unsweetened

varieties (Vanga and Raghavan, 2018). Parents who prefer plant milk should select products that are labelled as 'unsweetened' or check the ingredient list to ensure that there are no added sugars or sweeteners.

An overwhelming number of parents in our study were concerned about the amount of preservatives found in some plant milk products. Additives and preservatives such as stabilizers, thickeners and emulsifiers are often added to plant milks to improve their texture, taste and shelf-life (Drewnowski, 2021). Although additives and preservatives have no inherent nutritional value and may have questionable benefit to children who are more vulnerable to their effects (Kraemer et al., 2022), they do enable the fortification of certain nutrients that may otherwise be unstable in plant milk products (McClements, 2020). To minimize children's exposure to preservatives in certain plant milks, parents can choose plant milks with shorter ingredient lists or products where preservatives are listed towards the end of the ingredient list.

Many parents were concerned about the presence of hormones in cow's milk. Although the use of synthetic growth hormones is permitted to increase milk production in dairy cattle in the United States, many countries including Canada have banned their use (United States FDA, 2022; Health Canada, 2012). As shown previously by Schiano et al. (2022), some parents believed that there are no added hormones in organic cow's milk. Although this may be true in the United States, all cow's milk sold in Canada (organic or non-organic) is free of added hormones (Health Canada, 2012). Nonetheless, whether or not dairy cows are treated with hormones there are naturally occurring hormones present in *all* cow's milk, and the long-term effects of these hormones are not clear (Malekinejad and Rezaabakhsh, 2015). Uncertainty about hormones in cow's milk may explain why some parents prefer plant milk over cow's milk for their children.

Parents were concerned not only about hormones in cow's milk but also about phytoestrogens in soy milk. Due to their similar structure to human estrogen, soy phytoestrogens can bind to estrogen receptors in the body producing weak estrogen-like effects, which has fueled the widely held belief that soy milk consumption may have negative hormonal effects in children (Messina et al., 2022). However, research has shown that moderate consumption of soy milk does not have adverse effects on children (Messina et al., 2017) and may even offer health benefits for children, such as reducing the risk of certain cancers in adulthood (Trock et al., 2006).

Parents and physicians preferred plant milk based on the belief that these beverages have a lower environmental impact compared to cow's milk. This finding is consistent with McCarthy et al. (2017), which found that many consumers choose plant milk over cow's milk for environmental reasons. Parents in our study expressed a desire to choose milk products that have a lower environmental impact, though not at the expense of their child's nutrition. This

aligns with previous research, which indicates that parents prioritize their child's health above all other concerns (Schafer et al., 2012).

The strength of our study is that parents were recruited from primary care clinics, which provided a sample of parents highly relevant to our research questions. In addition, the purposeful sampling of parents known to provide plant milks to their children helped to ensure that we captured a wide range of perspectives on the topic. Semi-structured interviews gave participants the opportunity to elaborate on their opinions, providing data richness that is challenging to achieve through quantitative methods alone. Our study also had some limitations. The views of the small sample of parents residing in Toronto who took part in the study may differ from those who did not participate and may not represent the views of all parents in Canada. Moreover, parents and physicians volunteered to be interviewed which may have resulted in a sample of participants with a greater interest in nutrition. Another limitation of our study is that we did not collect data from parents about the amount of plant milk consumed by their children and, therefore, it is not clear whether these beverages were used occasionally or as a primary source of nutrition. Finally, interview bias is an inherent limitation of qualitative research. However, the interviews were conducted by a registered dietitian with prior training in counselling and interviewing skills, and the interview questions were reviewed by other researchers to mitigate the risk of a biased script and leading questions.

Conclusion

In summary, our study shows that parents and physicians choose the milk for their child or patient that they consider the healthiest, but lack of clarity about whether plant milks are healthy for children resulted in ambiguity about which milk is best for children. To determine whether plant milks are a healthy option for children and to understand the long-term effects associated with their consumption during childhood, longitudinal studies that follow children who consume plant milk throughout childhood and adolescence are needed. With plant milks being increasingly consumed by children, regulating the production and labelling of these products and educating parents on how to read and interpret nutrition labels is necessary to ensure adequate nutrient intake in children who consume plant milks.

Author's contributions

IS and JLM conceptualized and designed the study, lead the collection, analysis and interpretation of data, drafted the manuscript and had primary responsibility for the final content. CJP contributed to data collection, analysis and interpretation of the results. All authors critically reviewed and revised the manuscript.

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Availability of data and materials

Data and materials are available upon request.

Declaration of conflicting interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical approval

The study was approved by the research ethics board at St Michael's Hospital. Written informed consent was obtained from all participants.

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