PERCEPTION, PREFERENCES OF PARENTS LIVING IN LEBANON AND THE FACTORS THAT AFFECT THE BABY FOOD PURCHASING BEHAVIOR

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LYNN YOUSSEF ABI RIZK

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Notre Dame University - Louaize

Faculty of Nursing and Health Sciences

Department of Nursing and Health Sciences

We hereby approve the thesis of

Lynn Abi Rizk

Candidate for the degree of Food Safety and Quality Management

Dr. Christelle Bou Mitri

Supervisor, Chair

Dr.Sibelle El Watchi El Hayek

Committee Member

Dedication

To my grandmother – my angel in heaven.

Acknowledgment

I wish to express my special thanks the thesis supervisor Dr Christelle Bou Mitri and Dr Sibelle El Watchi El Hayek who gave me the golden opportunity to do this interesting project on the topic of baby food Special thanks to NDU and specially the faculty of nursing and health sciences and Dr. Jessy El Hayek

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Abstract

Purpose: The aim of this study was to present and evaluate the perception, preferences of parents. Living in Lebanon and the factors that affect the baby food purchasing behavior.

Design/methodology/approach: A cross sectional study was conducted among 86 expecting moms and parents of babies between 0 and 3 years old living in Lebanon, between April and June. The results were statistically analyzed using SPSS v.22 with a statistically significant p value < 0.05. Findings: As a result of the conducted research, the most important conditions, shopping habits, attitudes, and preferences of parents towards ready-made baby products available in Lebanese Market were revealed. Among the participants, 72% are willing to try new Lebanese baby food made locally. Among parents ,72.1% are doing baby food at home. Parents in Lebanese prefer ready eat puree over frozen and dried. Around half of the parents buy organic baby food from time to tome however 47% are willing to purchase organic baby food. For the packaging, 51.2% prefer jars over pouches and plastic containers.

Practical Implications: The results of the study could be useful for marketing strategy for manufacturers, suppliers and distributors of food for babies in Lebanon. It could be also useful for food scientist, nutritionist, and parents of parents living in Lebanon as it provided insight regarding strategy to take for the development of new food products.

Originality/Value: This is the first study conducted in Lebanon and the Middle East and North Africa region especially in a crisis and post COVID-19.

Keywords: Parents in Lebanon behavior, baby food market, nutrition, preferences of food,

infant

Chapter I

1. Importance of baby nutrition in the first year of life

Nutrition in early life is a significant factor affecting later health of individuals (De Cosmo et al., 2017). Infant formula and baby foods are the most significant part of baby's diet in the first year of life (Erkekoğlu et al., 2010). Popularity of baby foods is increasing more every day since they are nutritive and easy for babies to use and consume (Nepalia et al., 2017). The medical community consider infant formulas acceptable for infant under the age of 1 year when breastfeeding is not possible (Erkekoğlu et al., 2010). The Dietary Guidelines for Americans and American Academy of Pediatrics recommend children to consume foods other than breast milk or infant formula when they reach 6 months old (introducing baby food before 4 months) for a healthy newborn whose mother is unable to provide sufficient breast milk, the current option of choice is the infant formula (Martin et al., 2016). A study by the European Journal of Epidemiology, declared that infants who ate healthy foods had higher IQ scores by age 8 years than those who ate less healthy food (Good Therapy, 2012). The exposure to various solid foods and breastfeeding until the age of 4 months and the exposure to various solid foods has good effect in terms of allergic, immunologic, obesity, and cardiovascular diseases prevention (Elenberg & Shaoul, 2014).

2. What is Baby Food and Infant Formulas?

Baby foods are foods selected for nutrition of infants and young children between 4 to 6 months and 2 years old (WHO, 2009). Baby food has a soft and liquid texture and is easy to

be chewed by babies from the age of 6 months to 2 years (Erkekoğlu et al., 2010). It comes in a many varieties and flavors that are purchased ready-made from producers, or it may be table. Baby food are either puree or particles of fruit vegetables and meat or infant formula. Infant food is a nutritious and balanced composition in the purpose of replacing breast milk (Floris et al.,2010). Infant formulas are accepted for infants under one-year-old in case the breast feeding is not possible (Erkekoğlu et al., 2010). Baby food serves the most population vulnerable to illnesses and toxins. Baby food serves as food for a group of our population that is more vulnerable to illnesses and toxins, and therefore baby food manufacturers have to be extra vigilant with regard to the quality of their raw materials and processing and quality parameters

3. Baby Food Composition

The main ingredients of baby food are cereal-based baby foods that are important sources of nutrition in diets of infants (WHO, 2019). Cereals are one of the first solid foods introduced to a baby. The categories used for the production of baby foods are biscuits, cereals, rice cakes, corn, wheat, oat (WHO, 2019). Child can eat a variety of foods from different food groups such as infant cereals (barley, oat, multi grain…), meat or other proteins, fruits, vegetables, grains, yogurts and cheese (AAP, 2019). Baby food includes several purees made from fruits, vegetables combined with meat chicken or fish (Erkekoğlu et al., 2010).

Baby food is a a good and significant source of protein for babies (on fat dry milk, condensed skimmed milk soy milk, soy isolate milk), oils (soy, corn, sunflower, palm copra.), carbs (lactose, starch, sucrose, corn syrup and corn syrup solids), macro minerals (calcium

carbonate, mono di and tribasic calcium phosphate, magnesium chloride) micro minerals (zinc, sulfate, potassium iodide, ferrous sulfate, magnesium sulfate) and vitamins (A, E, K, C, B B2, B6, B12, folic acid, biotin, chlorine,..) (Nasirpour et al., 2006).

4. Preferences of baby food

During early childhood, infants are more likely to accept new foods, and parents should promote a varied diet to help in increasing child's curiosity towards food and to reduce food neophobia in toddlers (De Cosmi et al., 2017). The preferences of baby foods toward fruit or vegetables, meat or plant based is not assessed yet and information are scarce. Studies showed that consumer preferences for product origin and processing scale of organic baby food. Baby food consumers have consented to the benefits of organics over conventional counterparts and despite heterogeneity in preferences all were willing to pay a premium for organic products (Peterson & Li, 2011).

5. Baby food market

Baby foods are produced worldwide and marketed under various brands. Based on parents' preferences, the most famous ones are listed in Table 1. Each of these brands present specific features including the type flavors, mixes, packaging, quality certification among others**.**

Table 1 – Baby food brand and their features

Baby Food Brands	Features
Beech-Nut Naturals	Best overall jarred baby food, butternut squash flavor
Plum organics stage 1	Best organic baby food, peaches flavor
Gerber organic 1st food	Best budget friendly baby food, banana flavor
Happy Baby Clearly Crafted Stage 1	Best organic jarred baby food, carrots flavor
Gerber organic 1st foods single grain cereals	Best first baby cereals, organic oatmeal.

6. Baby Food Quality

Gerber is one of the universal driving infant nourishment brands which points to make strides the quality of an infants' life whereas giving carefully fabricated dinners that meet their needs and offer assistance them to develop soundly. They have created a framework where they can follow back their natural product and vegetable crops to the areas in which they were developed, and they proceed to utilize the same trustworthy provider that gives the most elevated quality crops that guarantee security. This can be crucial since non-reputable providers may give create that's sullied with natural contaminants, poisons or overwhelming metals (Gerber, 2021; IFT, 2003).

7. Sources of Contaminations

Food safety becomes crucial when it comes to protect infants from contaminants and health risks (Nobile et al., 2020). Contaminants are a significant subject area of food safety and quality and can be present in the food chain from raw materials to finished products (Erkekoğlu et al.,2010). Thus the safety of baby food products should be checked before introducing it to the market (Nepalia et al,. 2017).

8. Microbiological Contaminants

Several studies, conducted worldwide, have reported microbial contaminations in baby food. Outbreaks linked to baby food consumption were also reported. Contamination can be present at all levels of production. Dry infant formulas have been considered as a good

environment for bacterial growth of *E. sakazakii* that can cause important public health concerns due to the virulence factors that can cause several diseases such as meningitis and enter colitis in babies and may lead to death. Several outbreaks were recorded (mortality rate in infants 40 to 80 %) (Erkekoğlu et al.,2010).

A Korean study in 2011 assessed 75 powdered infant formula, that showed high APCs. Coliforms were found in 6 products, *Cronobacter* isolated in 10 baby foods, *Bacillus cereus* in 48 products (cereal based, rice soups, honey samples, biscuits and liquid) (Kim et al., 2011).

Bacillus cereus toxins relating genes were detected in 205 samples of infant formulas 10.20% of these samples were contaminated with *B. cereus* (Sadek, et al, 2018).

9. Chemical Contaminants

Exposure to even small amounts of chemical contaminants at an early age may increase the risk of several health problems, especially lower IQ and behavior problems, and have been linked to autism and attention deficit hyperactivity disorder (Kuzemchak, 2021). Various studies and scandals on chemical contaminants in baby food were reported.

500 infant formulas and baby foods picked from groceries shops in America and tested to show about 25 % contamination which exceed state or federal safety guidelines. Lead, arsenic, mercury, bisphenol A (BPA), and acrylamide were among the contaminants (Clean Label Project, 2017).

Chemical Contaminations in Baby Food includes acrylamide, furan, mycotoxins, monosodium glutamates, heavy metals, arsenic and many more that are found in different

ingredients related to baby food puree and other infant formulas (Nepalia et al., 2017). These substances can cause hepatotoxicity, as well it can cause cancer since it shows mutagenic effects and immunological problems as well as they may contribute to antibiotic resistance and affect dramatically consumers' health (de Mendonca et al., 2020).

Furan is produced during thermal processing of different types of foods especially baby foods (Javed et al., 2021). Furan is a toxic and carcinogenic compound that lead to death of infants and babies (Javed et al., 2021). it's hard to detect furan due to the high volatility and molecular weight (Javed et al,2021). The only method that helped in the reduction of furan was the HPP (high – pressure processing) method and now baby food products are available from different food companies (Javed, 2021).

Acrylamide is considered a monomer that can be present in heated high starchy foods. It can cause adverse health effects in humans such as cancer and neurological problems (Mojska et al.,2012). The maximum level that a baby food should be exposed to is between 0.41 to 0.62 μg/kg b.w./day whereas a study on assessing levels of acrylamide in different baby food products shows a range between 2 to 516 μg/kg which is a scary concerns affecting babies' health (Mojska et al.,2012).

Various other toxicants were reported in baby food and summarized in table 2.

Table 2-Chemical contaminants in different types of food used for baby food production

Chemical Contaminants	Type of product	Health concerns	Source of contamination	Acceptable limits	Official methods for quantification	Authors (Year)
Acrylamide	Bread, crackers, baby biscuits, cereal foods, bread, coffee	Cancer, Nerve damage, Muscle weakness	Plant based Food, Environment, contaminated water.	0.3 To 0.8 µg/kg(BW)	Liquid Chromatography and GC-MS	Nepalia et al., 2017
Mono Sodium Glutamate	Vegetables, Meat	Chest pain, numbness, nausea, rapid heart beat	Fermentation of plant-based ingredients like sugar beets, corn	3 g of MSG per day	HPLC, HPTLC	Nepalia et al., 2017
Furan	Fruit based products (Nepalia et al., 2017)	Carcinogen ic fatal	Produced due to heat on thermal processing	1.23 and 1.01 µg/kg bw/day	GC-MS	Nepalia et al., 2017
Pthalates	Plastics and packaging materials,(Nepa lia et al., 2017)	Allergic Problems Asthma eczema	Personal care products, medications, and plastics	1 mg/kg	GS-MS	Nepalia et al., 2017
Mycotoxins	Sorghum, rice, mung beans, cereals(Nepalia et al., 2017)	Nephropath y, neurologica l disorders, skin damage	Fungi, molds	1.9 µg/L	GC-MS	Nepalia et al., 2017

Phycotoxins and Plant toxins	Plants food (Nepalia et al., 2017)	Acute liver disease Respiratory problems	Marine toxins Plant toxins	160 µg OA-eq/kg for DSP toxins	GC-MS	Nepalia et al., 2017
Arsenic	Rice, water, nondairy formulas,(Nepalia et al., 2017)	Lung cancer, Kidney cancer,	Contaminated drinking water and food	0.01 parts per million (ppm)	HPLC GC	Nepalia et al., 2017
Nitrates and nitrites	Vegetables, fruits, milk	Thyroid and gastric cancer	Found In processed meat	1 ppm (1 mg/L)	Anion ion chromatography	Nepalia et al., 2017
Bisphenol A (BPA)	Plastic bottles, cans jars	Childhood asthma, neurological and immunity disorders	polycarbonate plastics and epoxy resins (Packaging)	0.2 ppb of drinking water . (0.18 µg kg−1 body weight day−1)	HPLC GC-MS	Nepalia et al., 2017
Poly aromatic hydrocarbons	Oils, cooked baby vegetables, fruits, canned foods, smoked meat, ham	Kidney and liver damage	Naturally found on gasoline	0.2 ppb of drinking water	UV and fluorescence detectors	Nepalia et al., 2017
Chemical Contaminants	Type of product	Health concerns related to these Chemical	Source of contamination	Acceptable limits	Official methods used to quantify Chemical contaminants	Nepalia et al., 2017

	Contaminants

10. Good Manufacturing (GMP) and Good Agriculture Practices (GAP)

Residues and contaminants can enter the supply chain of baby foods at various points (de Mendonca et al., 2020). Environmental contaminants can occur naturally. They are present in soil, plants, air and water. Applying Good Manufacturing Practices (GMP) and Good Agricultural Practices could minimize the occurrence of agricultural chemicals, microbial contamination. Following the proper steps is critical for all foreign or local manufacturers since importers are also responsible to guarantee that the products they are importing are risk-free and have undergone the same procedures required to ensure the safety of the same food items followed in their country.

11. Packaging materials

Packaging materials and storage containers can be a huge source of chemical contamination to baby foods (Mercogliano et al., 2018). Chemical entering the food through packaging are Bisphenol A (BPA), Phthalates, Poly Aromatic Hydrocarbons (PAH's) (Nepalia et al, 2017). Bisphenol A is a chemical agent coated on plastic bottles, cans and jars for packaging of baby foods. (Nepalia, A., et al 2017). Bisphenol A is used for synthesis of polycarbonate and epoxy resins and is considered a significant contaminant in food. Bisphenol was detected in 59 infant formulas samples collected for different neonatal nurseries (Cirillo et al, 2015). The health side effects of bisphenol are obesity and heart diseases, it is an estrogen mimicker and can disrupt the endocrine system as well as it can cause nerve and behavior problems in infants and children. (Nepalia et al., 2017). Many other studies have found the lids of baby food jars contain hormone disrupter Bisphenol A (BPA) which is linked to infertility and

breast cancer (Misra, et al., 2015). Commercial Baby food packaging is also responsible for exposing babies to a carcinogenic toxin called semicarbazide (SEM). This toxin is linked to cancer of the lungs and can accumulate in organs such as liver, heart, and lymph nodes and can lead to death (Misra et al., 2015).

Phthalates are used as plasticizers in plastic products to increase flexibility and longevity of plastic materials. Babies might be exposed to phthalates more than adults, the daily exposure to it was 9 µg/kg bodyweight/day in infants and 19 µg/kg bodyweight/day in toddlers. This high risk exposure is due the mouthing behavior (Nepalia et al., 2017). According to no harm–us Canada, phthalates can cause damage to the liver, kidneys, lungs, and reproductive system of the baby.

Poly Aromatic Hydrocarbons (PAH's) is a large class of organic compounds. They have a mutagenicity and carcinogenic effects. They are present in cooked vegetables and fruits and other canned barbequed food stuffs. PAH's can bind DNA and cause potential cancer risk (Nepalia et al., 2017).

12. Factors affecting nutrients in baby foods

The market for processed food is rapidly growing as the same time thus the industry needs methods for "processing with care" leading to high quality products to meet expectation (Seidel, et al., 2015). Processing methods used in production of baby food influences the quality of final product through various factors (Seidel et al., 2015). In the case of carrots puree: The ingredient composition and quality of raw material (example size) (organic and non-organic) influence carotenoid contents and bioavailability of baby meals (Jiwan, et al.,

2010). Mechanical homogenization has the potential to increase bioavailability of carotenoids (Van hat Holf et al., 2000). Heat treatments such as sterilization decrease bioavailability of carotenoids and water-soluble vitamins (Yim et al., 2004).

The outsourcing of preprocessing steps (peeling, cutting, blanching, freezing) can affect the final product (nutrients content, quality). Blanching is used to reduce microbial load, stabilize quality and inactive enzymes as well as improving final product safety regarding heat induced neoformed contaminants such as carcinogenic compound furan (Crew et al., 2007); however, it can cause undesirable changes in physiochemical properties such as dark color and softer texture (Goncalves et al., 2010). And decrease nutrient content on account of heat- induced and leaching losses (Seidel et al., 2015).

Concerning the period of storage, it can increase the sugar content and drip loss. Freezing temperature is the most critical factor affecting the cell structure of the vegetable as well as structure. Gap: Consumer lack information about processing, methods used and techniques (Prestamo et al., 1998).

The results of the study conducted by Seidel et al. (2015) showed that the quality parameters determined for the sterilized end-product differ depending on the raw material (fresh, stored or blanched and frozen). Blanching and freezing cause significant changes in the measured parameters compared to fresh products.

Stored raw material decrease the effects on the contents of carotenoids and volatile compounds. lutein was more resistant to blanching and freezing than storage. Heat processing can decrease the total carotenoid concentration. Frozen carrots resulted in higher decrease

in carotene content that fresh carrots. The sensory evaluations were the same for stored of fresh.

High pressure processing (HPP) as one of the leading non thermal food processing technologies provide safety of food with fresh-like properties with minimal lost on nutritional and sensory properties; however, limited number of studies involve bioavailability of these compounds Evrendilek, G. A. (2018). High thermal processing such as sterilizing, resulted in a sweeter, fruitier tasting puree that at the same time has a stronger taste in the bitter and harsh characteristics (Seidel et al., 2015). The use of frozen raw material can contribute to a milder taste (less bitter taste, harsh taste and after-taste) and waterier texture besides reduced sweet and fruity taste (Seidel et al., 2015).

13. Difference and most common techniques used in the production of baby foods

The quality of the baby food product varies greatly by brand these variations go beyond flavor combinations they depend on the preparation, packaging and storage of the product which differs dramatically based on the processing technique used. The company processes may affect baby food ultimately affects nutrition, safety, flavor of the end-product. The top food processing techniques used in baby food production are Retort processing, high pressure processing (HPP), and aseptic processing.

Table 3-advantages and disadvantages of the most used techniques in baby food production

Techniques used for processing of Baby Food Puree	Description	Advantages	Disadvantages	References
Retort Processing	Traditional canning methods, introduced flexible plastic & foil pouches	-Fast procedure uses less energy. -Cost savings. -Help maintain high levels of vitamins, minerals, and other nutrients	Introducing preservatives like citric acid to prepare the baby food.	Little spoon, (2020)
HHP	High Pressure Processing is considered a c pasteurization technique are introduced into a vessel and subjected to a high level of isostatic pressure.	-Rapid, less thermal degradation, less process time, inactivation of microorganisms such as Salmonella, E coli, Listeria -Doesn't affect the flavor, nutritional value , and texture properties of food, shelf life extension	-Food must contain Water to use HHP. -Cannot use it for Proteins due to denaturation -Not suitable For enzyme and spore inactivation.	Chawla et al., (2011)
Aseptic Technique	uses high-temperature short-time sterilization. This technique preserves the food's natural flavor and nutritional value	Less food waste Keep food safe and fresh for more six months. No need for refrigeration or preservatives..	Expensive for both the industry and the consumer	Little spoon, (2020)

14. Nutrients and anti-nutrients in ingredients of baby food

The essential nutrients that a baby need for growth and staying healthy are calcium, fat, folate, iron, protein and carbohydrates, zinc, Vitamin A, B1, B2, B3, B6, B12, C, D, E, and K (Webmed,2021). The methods used to assess those nutrients present in food are laboratory analysis such as Immunoassays (protein assessment) and mass spectrometry (GC-MS) (Azom, 2019).

Table 4- Some of the nutrients and their recommended levels for babie

Nutrients	**Recommended intake**	
	7 to 12 months	1 to 3 years old
Vitamin A (µg)	500	300
Vitamin C (µg)	50	15
Folate (µg)	80	150
Phosphorus (mg)	275	460
Calcium (mg)	270	460
Vitamin K (µg)	25	30
Iron (mg)	11	7
Iodine(µg)	130	90

Anti-nutrients are found in most plant foods (cereals, legumes) (Roos, et al., 2013). The content of anti-nutrients in processed foods depends on the ingredients and processing (Roos, et al., 2013). Anti-nutrients are food components which can have a negative impact in

nutritional status of the consumer. Several anti-nutrients are detected in food including phytate, polyphenols, inhibitors of trypsin, chymotrypsin, and lectins (Samtiya et al., 2020). Moreover, some minerals could be considered anti-nutrients because they could interfere in the absorption of other nutrients (Samtiya et al., 2020). These anti-nutrients and minerals are associated with various products as presented in the below table.

Roos et al. (2013) reported in 52 assessed samples representing 36 different products of local blended foods high levels of phytate (68 to 1536 mg/ 100 g) in processed cereal and legume-based products. Total Polyphenols levels varied between 1.3 and 9.3 mg gentisic acid equivalents g^{-1}.

Table 5-Different anti-nutrients in the food health concern, and techniques to assess them.

Anti-nutrients	Food associated	Health Concerns	Technique used to assess concentrations of anti-nutrients
Glucosinolates	Vegetables (broccoli)	Thyroid problem (malabsorption of iodine), goiter, hypothyroidism	Mass spectrophotometry
Lectins	Legumes (Beans, Peanuts, soybean), whole grains, walnuts, pistachio, hazelnuts, cashew, teff, quinoa)	Interfere with the absorption of calcium, iron phosphorus, and zinc	Affinity chromatography
Oxalates	Green leafy vegetables, tea, carrots, sweet potato, artichoke, wheat, barley	Bind to calcium and cause malabsorption	Ion chromatography, HPLC, GC, chemiluminescence detection
Phytates	Whole grains, seeds, potatoes, nuts, eggplant, tomatoes, lentils (mainly in all legumes and grains)	Decrease absorption of calcium, iron, phosphorus, and zinc	AOAC anion-exchange method. Near-infrared spectroscopy methods. High performance liquid chromatography
Saponins	Legumes, whole grains,	Interfere with normal nutrient absorption	color reactions and hemolysis. TLC, HPLC
Tannins	Bean, coffee, legumes	Decrease iron absorption	UV-VIS Spectrophotometry

15.Techniques to eliminate or reduce anti-nutrients

Several techniques were implemented and developed to assess the anti-nutrients presence and content in food

Table 6-Strategies to remove anti- nutrients in food related to babies diet

Milling	Soaking	Germination	Fermentation	Autoclave and Cooking
Milling is the most traditional separate method. it removes anti-nutrients (e.g. phytic acid, lectins, tannins) in grains	Soaking is method for removing anti-nutrient content of foods	Germination commonly changes the nutritional level, biochemical property and physical features of the foods	Fermentation is such an important process, which significantly lowers the content of anti-nutrients such as phytic acid, tannins, and polyphenols of cereals	Best method to reduce levels of several anti-nutritional compounds when compared to other processing methods

Table 7-Analytical techniques used to assess anti-nutrients.

Minerals	**Phytate / Phytic acid**	**Polyphenols**	**Trypsin and chymotrypsin inhibitors**	**Lectin**	**Glycoprotein**
Atomic absorption spectroscopy (Spektr-AA 200) And Acidic destruction in DigiTUBEs	High performance liquid chromatography And High performance ion chromatography	Standard colorimetric method	Microtitre wells	Affinity chromatography	Affinity chromatography

16.The effect of baby food processing on anti-nutrients presence in baby food and level

Heat treatment is the most effective method to reduce the anti-nutrition factors present in green leafy vegetables (Natech et al., 2017). Cooking and blanching helps in the removal of anti-nutrients through rupturing the plant cell wall followed by leaching out of soluble compounds into the blanching medium. (Natech et al., 2017). The levels of phytic acid and oxalic acid can be effectively reduced by cooking and blanching methods however we can lose some nutrients (Natech et al., 2017).

Thermal processing of leafy vegetables through boiling, cooking and blanching before consumption help in reducing the level of anti-nutrients (Natech et al., 2017).

Another study conducted on lima bean showed that raw lima bean contain cyanide, trypsin inhibitor, lectin, phytin, and tannin and after autoclaving, soaking and toasting there were complete reduction of trypsin inhibitor and lectin ($p < 0.05$). Except for tannin autoclaving for 20 min was found to eliminate all other anti- nutrients (Adeparusi, 2002).

A study assess cowpea showed that soaked cowpea samples had the lowest nutritional content and greatest anti-nutritional content. Boiling allowed for an improved protein content (19-21%) and was the most effective in reducing cyanogenic glycosides (0.18-0.38 mg/100 g), phytic acid (±1.21 mg/100 g), tannins (0 mg/100 g) and trypsin inhibitors (55-155 TIU/g). While, autoclaving was the most effective in reducing the oxalic acid (±2 mg/100 g) content based on the presence of water-insoluble oxalic acid. It is concluded that the use of heat processes reduces the presence of anti-nutritional factors and thus precedes to an increased nutritional content (Jaichand et al., 2020).

15. Best businesses companies of baby food production Worldwide

The global market for baby food is becoming competitive due to the presence of a huge regional players in different countries. The best companies in the baby food market till the year 2026 are Nestle, Danone, Reckitt Benckiser Group plc, Abbott Laboratories, Feihe International Inc, Royal Fries land Campina N.V., Shijiazhuang Jun lebao Dairy Co., Ltd., Ausnutria Dairy Corporation Ltd, Yili Group, and The Kraft Heinz Company (Globenewswire, 2021). Parents are continually concerned with getting the finest items

within the showcase and doing everything right so that their child is secure and sound. But the address is how parents decide which products are the most excellent and which ones are basically claiming to be the leading. Parents do this not as it were since they are extremely concerned approximately the security of their child but too since most to begin with time parents for the most part have no idea what the differences are between items. So these first time parents are progressing to be simple affected by whichever medium they are getting their data from. This can be profoundly coherent and truth based information that's unquestionable and does not shift depending on the client (Pavithra, 2018).

17.Conclusion

Serving babies with safe and nutritive food is a vital importance for the health and the development of baby food during the first 2 years of life (Erkekoglu et al, 2010). Various studies reported the presence of contaminants and anti-nutrients in baby foods, yet uncertainties are still high and there is a continuous need for every new baby food producer to assess all GMPs, food safety systems, raw ingredients and new technologies impact on reducing them. For mother there is a genuine need to decide the right thing for their babies, their perception and attitude toward baby formula that looking for safety, nurturing, and benefit for the baby are the dominant attributes to consider Thus, before doing any product development or working on providing Lebanese children with nutritive and safe product. Since the perception, knowledge, preferences of parents remains the first thing to tackle (Tambunan & Indriani, 2013)

Chapter II

1. Introduction

Nutrition in early life is a significant factor affecting later health of individuals (De Cosmo et al., 2017). Baby foods also called complementary baby food are foods used during the weaning process between 4 to 6 months and 2 years old as stepping-stone for infants to reach regular food selected for nutrition of infants and young children (WHO, 2009, LIBNOR 458:2001). Baby food is a soft and liquid in texture. It is easy to be chewed by babies from the age of 6months to 2 years old. Baby food come in many varieties and flavors. It can be either ready made from producers or table food. Baby food are important sources of nutrition in diets of infants (WHO, 2019). Baby food is a good and significant source of protein, oils, carbs, macro minerals, micro minerals, and vitamins (Naispour et al., 2006) Popularity of baby foods is increasing more every day since they are easy to consume and contains the nutrients that are essential for both cognitive and physical development of infants (Nepalia et al., 2017).

During early childhood, infants are more likely to accept new foods, and parents should promote a varied diet to help in increasing child's curiosity towards food and to reduce food neophobia in toddlers (De Cosmi et al., 2017).

The main stakeholders of baby food are Gerber, Beechnut, Happy, Hipp. According to studies the factors influencing baby food purchasing are quality, safety, packaging, organic vs conventional, availability, and product origin. Moreover, sociodemographic

characteristics affect purchasing behaviors such as education, income, and pediatrician recommendations.

The preferences of baby foods toward fruit or vegetables, meat or plant based is not assessed yet and information are scarce (Peterson & Li, 2011). Studies showed that consumers have preferences for product origin and processing scale of organic baby food. These consumers have consented to the benefits of organics over conventional counterparts and despite heterogeneity in preferences all were willing to pay a premium for organic products (Peterson & Li ,2011).

According to the baby food market analysis, the market is segmented in the basis of product type, the market is divided into dried baby food, milk formula, prepared baby food, and others. The distribution channel is fragmented into supermarkets, hypermarkets, small grocery retailers, health and beauty retailers. The global baby food market size was valued at $67.3 billion in 2019 and is projected to reach $96.3 billion by 2027(AlliedResearchMarket,2021).

However, In Lebanon due to the economic crisis, the availability of baby food products and infant formulas has become rare and even inaccessible and unaffordable. In this hard times, items essential for the health of infants disappears from shelves and becomes unavailable or available with extremely high prices (Scoop empire, 2021) Thus, it is significant to support the nutritional demands of the growing baby by providing healthy and safe baby food products (Hajagana et al, 2014). Mothers and their significance in baby products industry, has unique emotional behavioral qualities. For mother there is a genuine need to decide the right thing for their babies, their perception and attitude toward baby formula that looking

for safety, nurturing, and benefit for the baby are the dominant attributes to consider. Thus, before doing any product development or working on providing Lebanese children with nutritive and safe product; the perception, knowledge, preferences of parents remains the first thing to tackle (Tambunan& Indriani,2013).

Accordingly, this study addresses a gap in the literature and aimed to assess the perception, knowledge, preferences, acceptance, attitude baby's food of the Lebanese babies and to determine the factors affecting the purchasing behaviors. This study also aimed to obtain results that helps product developers, food scientist, nutritionist, parents to solve the current gap in babies' food and availabilities of these safe and healthy food that are crucial and a must to be available for all Lebanese babies.

2. Materials and Methods

2.1. Study design and population

A cross-sectional study recruited a convenient sample of 86 adults who are parents having babies aged between 0 and 3 years old or expecting a baby soon, living in Lebanon. The recruitment took place between April and June 20212. This study had been revised and approved by University Institutional Review Board # IRB 202214

2.2. Questionnaire design/ data collection

A questionnaire was developed on Google Forms and was self-administered by the participants. The recruitment was via snowball sampling using different social media platforms, especially pediatricians, influencers, and mom blogs. The questionnaire consisted

of four sections: section 1 socio-demographic characteristics of parents, section 2 children's health and the section 3 nutrition and dietary characteristics, section 4 preference, perception and purchasing behaviors related to baby's food. The questionnaire was translated to the English language and back to Arabic and necessary adjustments were made to obtain identical questionnaires in both languages. A pilot study was conducted among 15 individuals to ensure that all questions are well introduced and clear to answer. The clarity, suitability of wording and the average time needed for its completion were assessed. Participation is voluntary and anonymous and an explanation about the survey with its objectives and informed consent statement will be sent to all participants. The survey took about 10 to 15 minutes to be filled.

2.3. Statistical Analysis:

The data collected was coded and analyzed using the IBM's Statistical Package for Social Sciences (SPSS) version 22. Descriptive analyses were summarized as median and interquartile range or n (%). Comparisons of continuous and categorical variables such as purchasing behavior and socio-demographic characteristics were performed using independent samples T test and the chi-square test, respectively. Two logistic regressions were performed to test the associations between "preferences of food" (dependent factors) and "factors affecting the purchasing of food" (independent variables). A five-point Likert scale was used to know the power of each factor such as (organic, smell, texture) that affect the purchasing of baby food items The mean scores on the five-point design Likert scale were

transformed into percentages with a score of 0 corresponding to 0% and as core of 5 corresponding to 100%. A p-value < 0.05 was considered statistically significant.

3. Results and Discussion:

3.1. Participants characteristics:

This study recruited 86 participants. The mean age was 32.8 years old (std ±5.2), 89.9% were female and 98.8 % were ever married. The majority of our sample (87.2 %) are Lebanese, 72.1% of them live in Mount Lebanon and 14 % in South Lebanon. Our sample is highly educated, as 83% have a university degree. More than half of our participants are educated, as 40.7 % have a master's degree and 33.7% have a bachelor's degree or its equivalent. 40.7 % had a monthly income ranging between 1,200,000 and 5,000,000 LBP. The majority of participants get information about the nutrition of babies from pediatricians (68.6%) and the internet (51.2%).

3.2. Children's Characteristics:

Participants were asked about the number and age of children. The results show that 81.4% of children are between 0 and 6 months. The majority of the children, 74.4% are vaccinated and don't have any digestive problems (84.9%). Concerning allergies in general (skin, mouth, throat, abdominal, lungs and hearts) 70.5 % don't have any allergies related to the above. On the other hand, when participants were asked about eating behaviors of their kids, 83% reported that children are eating normal, neither more nor less than it should be. The majority

of answers on the questions of changing in the diet of children came with nothing, healthy lifestyle, more varied diet, reducing sugars intake, increasing meats, poultry, vegetables, and fruits in the diet. Half of the participants (55%) introduced sugar before 3 years, while the rest were afraid to introduce sugar before 2 years to prevent tooth decay, diabetes, and health issues later on. Only 34.9 % introduced baby food jars at 6 months, and 30.4% do not give jars to their infants. Most of the participants (35%) introduced home cooking at 6 months and solid foods at 12 months (27.9%).

Table 8-Sociodemographic characteristics of participants

Socio-demographic characteristics	Frequency (n)	(%)
Gender		
Male	9	10.5
Female	77	89.5
Age (years) Mean ±	32.8 years old (std ±5.21)	
Nationality		
Lebanese	75	87.2
Middle easten (Syrian living in lebanon)	11	12.8
Marital Status		
Married	85	98.8
Widowed	1	1.2
Monthly income (LBP) (n=86)		
<5,000,000 LBP	42	48.8
Between 5,000,000 and 12,000,000 LBP	22	25.6
More than 12,000,000 LBP	22	25.6
Employment Status		
Full time job	44	51.2
Part time job	8	9.3
Self emplyed or Work more than one job	15	17.5
Umployed	5	5.8
Housewife	14	16.3
Educational level		
High school or less than high school	15	25.5
Bachelor	29	33.7
Master or doctorate	42	40.8
Residence		
Mount Lebanon	62	72.1
South	12	14
Beirut	7	8.2
North	4	4.7
Having children	80	93
Expecting children	6	7
Number of children (1 to 7 children)	91	89.5
Source ofInformation about chidren's nutrition		
Pediatrician	59	68.6
Pharmacy	23	26.7
Internet	44	51.2
Education or books	25	29.1
Nurses	21	24.4
Pharmacy	23	26.7

The calculated behavior, preferences, perception, and factors that affect puchasing were assessed.

The correlation between whether the participants would purchase a new locally made organic brand and their preference of purchasing baby food with more variety was a significantly positive one. The calculated Pearson coefficient was 0.176 indicating a weak positive relationship, while the alpha value of 0.032 remained within the 0.05 level limit. This can be translated by saying that the participants who would prefer that baby food would be available in more variety would definitely try the different types of organic baby food made in Lebanon.

The correlation between whether the participants would purchase a new locally made brand and their concern of the nutrition facts label while purchasing baby food was a significantly positive one. The calculated Pearson's coefficient was 0.167 indicating a weak positive correlation, with an alpha value of 0.042 indicating that the relationship was significant at the 0.05 level. This indicates that even the mothers who are worried about the constituents of the purchased baby food in terms of nutrition would trust and purchase a Lebanese-made organic brand.

To further discuss these results based on the conversations with the participants, the women who have full time jobs (36%) had less time to prepare meals from scratch for their infants as oppose to the 64% who claimed to have more free time since they were either unemployed, worked part-time or worked freelance. Also, mothers who had more than one baby have changed the steps they have followed; for example, many of the mothers who solely

introduced home-made food to their first baby ended up introducing commercially made food to their second baby since it was less time consuming and just as nutritious.

Table 9-Children Characteristics

Children's Characteristics	n (N=86)	(%)
# of kids between 0 to 6 months (1 to 2 kids)	16	18.4
# of kids between 6months to 3 years old (1to 3kids)	73	84.9
Children Vaccination up to date (Yes)	64	74.4
Children eat more than it should be (NO)	72	83.7
Children eat less than it should be (N0)	60	69.8
Give Sugar to Kids (YES)	51	60.7
Age of Introducing baby food puree jars		
No introduction of jars	26	30.2
5 months	11	12.8
6 months	30	34.9
12 months	3	3.5
Age introducing home cooking to baby		
6 months	26	30.2
7months	9	10.5
12 months	15	17.4
24months	4	4.7
Age introducing solid Food		
8 months	11	12.8
6months	22	25.6
10 months	6	7
12 months	24	27.9

Table 10- Dietary Questionnaire related to babies

Diet Questionnaire about preferences of food used	n	%
Type of Milk Consumed (YES))		
Human milk	43	50
Infant Formula	43	43
Poudre Milk	31	36
Cows Milk	11	12.8
Goat Milk	3	3.5
Starting Age for Solid Food		
4months	6	7
5months	9	10.5
6Months	26	30.2
>6months	38	44.2
Type of of Food Consumed		
Table Foods	50	58.1
Mashed/blended	29	33.7
Finely chopped	24	27.9
Coarsely chopped/ sliced	23	26.7
Vitamins/Nutrtients Deficency (No)	65	75.6
Complete Diet (YES)	34	39.5
Vegetables Consumed (Yes)		
Potatoes	78	90.7
Carrots	76	88.4
Peas	68	79.1
Brocolli	59	68.6
Sweet Potatoes	54	62.8
Spinach	53	61.6
Green Beans	48	55.8
Pumpkin	48	55.8
Beet root	37	43
Cabbage	35	40.7
Turnip	23	26.7
Fruits Consumed		
Apple	80	93
Bannanas	78	90.7
Orange	71	82.6

Strawberries	60	69.7
Peach	49	57
Mango	45	52.3
Melon	43	50
Plums	41	47.7
Pineapple	40	46.5
Meat and Dairies Consumed		
Meat	73	84.9
Dairies	69	80.2
Poultry	69	80.2
Fish	61	70.9
Ham	26	30.2
Starches / Snacks Consumed		
Rice	76	88.4
Bread	71	82.6
Biscuits	62	72.1
Chocolate	48	55.8
Cereals	47	54.7
Sweetbuns	40	46.5
Cornflakes	35	40.7
Ricepops	17	19.8
Ricehusks	8	9.3
Lebanese Mixtures Consumed (YES)		
Potatoes, zuchini, carrots	76	88.4
Apple pear bannana	74	86
Lentils and chard	49	57
Green beans tomato	37	43
Zuchini chickpeas	35	40.7

3.3. Preferences of parents concerning babies diet

Preferences of food and drinks of the recruited parents were shown in the table 11 Most respondents reported using breast milk and infant milk in equal percentages (50%).When asking about when they introduced solid baby food, 70.4% reported introducing these foods from 6 months and above. Concerning the type of food consumed, 58.1% announce table

foods to kids and around 60% choose between mashed and finely chopped food. About 39.5% reflected that their children diets are a complete on. In addition , 73.6% informed no deficiencies in vitamins or minerals. Parents were asked about vegetables consumed by kids below 3 years old . In increasing order, these vegetables included: potatoes, carrots, peas, spinach, brocolli, sweet potatoes, pumpkin, and betroot. Fruits that were consumed included, in increasing order, apple, bannanas, strawberries,mango, peach , melon, plums, and pineapple. Meat is consumed by 84.9% of the participants, while dairies and fish are consumed in equal percentages (80.2% each). The fish consumption is 70.9% and ham consumption is 30.2%. The majority of kids consume starches such as rice, bread, cereals, and cornflakes (by increasing order). Parents were finally asked about Lebanese dishes and mixtures that they give to kids. The majority of kids(88.4%) eat potatoes, zuchini, and carrots mix. Around 60% consumed green beans tomato, 86% consume apple pear banana, and 40.7% chose zuchini and chickpeas as a meal consumed by their kids.

Table 10-Purchasing behaviors and perception, preferences of parents toward baby food

Purchasing Behaviors and Perception ,Preferences of Parents Toward Baby Food	Frequency (n)	%
Availability of Baby Foods in their area (Always)	46	53.5
Type of Packaging Purchased (Yes)		
Jars	44	51.2
Pouches	10	11.6
Plastic containers	5	5.8
Puchasing organic baby food (Sometimes)	48	55.8
Willingness to buy Organic Baby Food (Sometimes)	41	47.7
Type of food purchased (YES)		
Ready to eat Puree	39	45.3
Frozen	13	15.1
Dried	7	8.1
Places they puchase baby food from		
Do it at home	62	72
Considering price when purchasing (Sometimes)	39	45.3
Supermarkets	38	44.2
Pharmacy	35	40.7
Considering price when purchasing (Sometimes)	39	45.3
Maximum price paid for baby food jars	**Range between 20 000LBP and 250000LBP**	
Familiarity and Preferences of Brands (YES)		
Bledina	52	60.5
Hipp	44	51.3
Gerber	14	16.3
# jars purchased before currency devaluation		
0 jars	47	69
1 to 3 jars per week	18	20.9
3 to 5 jars per week	14	16.3
More than 5 jars per week	7	8.1
#Jars purchased after currency devaluation		
0 jars	53	61.7
1 to 3 jars per week	21	24.4

3 to 5 jars per week	7	8.1
More than 5 jars per week	5	5.8
Time of Purchasing Ready to eat baby food (YES)		
Going out/ traveling	39	45.3
When Not having time to cook for babies	22	25.6
For a change (new taste, new ingredients)	19	22.1
Always at any time and place	10	11.6
Daycare	3	3.5
Interesting to buy local baby food products (YES)	62	72.1

3.4 The association between Purchasing Behaviors and the Perception and Preferences of Parents Toward Baby Food:

Table 10 shows the purchasing behaviors, perception and preferences toward baby food. Around 53.5% of participants reported always finding baby food items, whereas 46.5% reported that these items are either found sometimes or never. About the type of packaging 51.2% reported choosing jars as a package for baby food items. Participants were asked if they purchased baby food and 55.8% choose sometimes as an option. In addition, they were asked if they are willing to buy organic if they didn't used it yet, and 47.7% reported that they may sometimes purchase organic items. About the most selected types of food are ready to eat puree (45.3%) followed by frozen (15.1%) , and dried items (8.1%). About places where they purchase baby food items, 72.7% chose pharmacy , 44.2% chose supermarkets. However, around 72.% chose doing baby food at home as an option. About 45.3% consider sometimed the price while puchasing and the maximum price reported that they will pay for a baby food item is 100 000LBP. Also, parents where asked about familiarity and preferences of baby food items The most purchased brand was Bledina, followed by Hipp then Gerber. On average, 60% purchased Bledina , 20% purchased Gerber and 25% purchased Cerelac, while 18%

chose other imported or local brands to purchase, such as Ella's Kitchen, Yummi tummi , Little Meli Solids, or just preferred anything organic on the market.. When asked whether their purchasing power was affected recently by the economic crisis that Lebanon is going through, The percentage of buying 3 to 5 jars per week decreases from 16.3 % to 8.1% comparing to before and after currency devaluation . In the same time bying more that 5 jars per week decreases from 8.1% to 5.2%. when asked about their purchase frequency, the answers varied among them. 11.6% purchased ready-to-eat baby food daily at any time , 45.3 % when going out or traveling, 2 % rarely purchased them few times per year or on special occasions, while 28% of the mothers never purchased them., 21% for a change , 25.6% for not having time to cook . Lastly, the question that greatly contributes to one of the purpose of this study relies on asking the participants if they would be interested in trying locally made Lebanese meals(Lebanese baby food products) and stews that are specifically made to meet the needs of their infants and growing children, while 72% were very excited about the idea and would love to try them.

Table 12- Factors affecting the purchasing behavior of parents

Factors affecting the Purchasing Behavior of Parents (YES)	n	%
Price of the product	36	41.9
Having help at home	31	36.0
Following new trend and healthy recipes	25	29.1
Pediatrics recommendations and perceptions	18	20.9
Covid 19 and Quarantine	22	25.6
Not trusting baby food brands available in Lebanese market	18	20.9
Baby led weaning	12	14.0
Tried these products but the baby reject them	12	14.0
Following new trends	6	7.0

Table 13- Purchasing Behavior of Parents

Purchasing Behavior of Parents	n	%
(Strongly Agree)		
Safety concerns		
Microbiological	55	64.0
Food Additives	54	62.5
GMO-Free	54	62.5
Allergens)	52	60.5
Quality Attributes		
Nutritional quality (sugar, salts, vitamins, minerals,fats)	47	54.7
Smell	40	46.5
Nutrtional Claims (low caloriw, high fiber, fat free)	39	45.3
Flavor	37	43
Texture	32	37.2
Appearance	34	39.5
Color	32	37.2
Texture	32	37.2
Country of origin	31	36

Packaging	30	34.9
Sensory attributes	27	31.4
Popularity (# followers, likes, promoted online products..)	26	30.2

Table 14-Association between sociodemographic characteristics and purchasing behavior (chi square $p<0.05$)

Factors	GMO P	Food Additives P	Microbiological concerns P	Organic P	Willingness to buy organic P
Income	0.335	0.226	0.439	0.095	0.078
Education	**0.061**	0.157	**0.044**	**0.001**	**0.000**
Employment	0.283	***0.065***	0.268	0.277	**0.017**
Price	0.258	0.258	0.465	0.099	**0.006**
Pediatrician's recommendation	0.939	0.924	0.915	0.588	0.849

P Values

Table 15-Factors affecting the purchasing behaviors of parents living in Lebanon toward baby food

Factor related to purchasing	Education
Bledina	**0.000**
Hipp	**0.001**
Gerber	**0.060**
Providing a complete diet in terms of nutrients and vitamins	**0.011**
Buying frozen baby food	0.072
Vaccination	**0.027**

Title: Education impact on the purchasing behaviors toward brands, complete diet for babies, buying frozen baby food items, and vaccination status.

3.5The Association between purchasing behaviors scores and socio demographic factors, pediatrician recommendation, income and price

The results (Table 13) showed parents with higher education level would look more if the product is GMO (p = 0.06), organic (p=0.001), and they would be more concerned about its microbiological safety (p value=0.044) as compared to those with high school or less than high school degrees (p=0.03). On the other hand, all the participants were equally concerned about the price or the presence of additives when purchasing baby food. Moreover, working parents and those with higher education are more likely willing to buy organic baby food items (p= 0.000, p=0.017, respectively). The price had a significant effect on the willingness to purchase organic food (p=0.006). The association between education factor and the familiarity with Bledina, Hipp, and Gerber shows high correlation with p values of 0.000, 0.001, and 0.060, respectively. Children vaccination status was correlated with being educated (p value =0.027) and providing a complete diet in terms of nutrients and vitamins shows correlation with educational level (p=0.011). Finally, buying frozen baby food was weakly associated with education level (p value=0.027).

This study provides novel information and reveals many critical features about the purchasing behaviors of parents living in Lebanon toward baby food and the factors that affect their buying behaviors

4.2. Sociodemographic characteristics and Children's Characteristics:

Parents of this study take information related to nutrition mainly from pediatricians and internet which is similar to the CDC,2022 who suggest that parents can surf websites and ask their pediatricians in order provide good nutrition for babies. Also similar to the finding of this study baby vaccination is based on education level and decisions and up to date vaccines for children are influenced by participant's lifestyle perception of health, and as well by the level of education of parents (Scharff et al., 2022). About the vaccination and education, a Spanish study by Mora et al., 2018 on the influence of education on vaccination shows a greater number of visits for advice about vaccinations can occur mainly because the greater the parental education, the more able parents are to identify severe ill health, and thus, the more conscious they are of the need to visit a doctor. This results are similar to the results of this study which shows a correlation between up to date vaccine and education.

The results of this study showed that the mean age of solid food introduction was at 5 to 6 months of age, in this study the average age of introduction of solid food is 12 months, and 6 months for baby food jars puree. Among Australian mothers' Assessing seven focus groups with 42 mothers each of infants between the ages of 4–18 months were chosen showed that the introduction of solid food was 9.6 months and mean age of introduction of solid food was 4.3 months (Begley et al.,2019)The American Academy of Pediatrics (AAP) recommends complementary food introduction at the age of 6 months and states that any introduction before 4 months old is too early since the gastrointestinal tract is still considered immature (Chiang et al. 2020). In Canada, at 6 months of age, breastfeeding should still be the main source of nutrition;

however, it should be supplemented by the introduction of solid food in order to meet the

growing needs of the infant. This is similar to the milk that kids living in Lebanon are consuming which is mainly between human milk or infant formulas

Results are similar maybe due to the participants who are highly educated individuals and knowledgeable about babies nutrition.

This study showed that people are introducing different type of food like mashed food, blended, finely chopped, coarsely chopped or sliced. The Dietary Guidelines for Americans and the American Academy of Pediatrics recommend children be introduced to foods other than breast milk or infant formula when they are about 6 months old (CDC.2022). Also the CDC suggest that to prevent choking, foods should be prepared in a way that can be easily dissolved with saliva and do not require chewing. Food should be introduced in small portions and encourage your baby to eat slowly. Always watch your child while he or she is eating (AAP, 2022) Introducing foods before 4 months old is not recommended (CDC,2022) Every child is different. EFSA recommends that once the infant begins eating, food must be pureed in order to reduce the risk of choking, while the type can progress. These results suggested that parents in Lebanon follow international recommendation and have high awareness toward type of food of their babies and automatically their safety and health

4.3. Dietary questions related to baby's diet

Concerning the preferred consumption of vegetables and fruits, this study shows that children are consuming almost all types of vegetables and fruits. This result is not similar to a study on maternal feeding practices and toddlers' fruit and vegetable consumption in Ireland there is insufficient consumption of fruit and vegetable is prevalent among toddlers, and has

become a global public health issue (Liu et al., 2021) Maternal feeding practices are potential factors influencing toddlers' dietary intake, including fruit and vegetable intake (Liu et al.,2021). It is suggested that Lebanese parents introduce these fruits to their babies because they are available and affordable in the market, while it is possible that in other countries these fruits and vegetables are less accessible.

4.4. Preferences of foods and factors affecting the purchasing behavior

Half of participants of this study indicated that baby food are available always. These results are not surprising since Lebanon is facing an unprecedent economic crisis affecting the import of most product while baby food more specially are all imported without any produced locally.

Around half of the parents of this study preferred jars packaging over pouches which is similar to the study conducted by Bou Mitri et al. (2019) on the packaging choices of Lebanese consumers (n= 547) that say jars are preferred due to the transparent package that helps individuals to see the food before buying it as well it's a good packaging in terms of chemical contaminants. However, these results are not similar to many studies conducted in Europe and America where people prefer pouches over jars, as this is probably related to the environment awareness they have in their countries (packagingstrategies,2021)

Parents of this study are willing to pay very high amounts for small jars despite the economic situation which shows how they are aware about their children nutrition and health.

For the purchasing of organic baby food and the willingness to buy organic food, it was similar to different studies. A review by Peterson et al. (2011) on organic food in diet and

health concerns reported that people are more like to purchase organic baby food over conventional food. Parents of this study are willing to pay very high amounts for small jars despite the economic situation which shows how they are aware about their children nutrition and health. However, in this study the willingness to buy organic food was affected by the price of the product which is similar to the study done on the influence of consumers personal factors (n= 609) toward organic food which shows that organic meat purchase in Vietnam decreased due to the price of organic item (Nguyen et al., 2019).

The factors that affect purchasing behavior of parents in Lebanon, the price of the products remains a significant factor affecting buying behaviors of parents. However, COVID-19, quarantine, baby led weaning, not trusting Lebanese baby food are not statistically significant factors.

Parents of babies living in Lebanon shows poor knowledge about genetically modified crops (GMO) as an option to choose when buying baby food (p values > 0.050). Responders of this study shows similar knowledge about GMO many in the United States support mandatory GMO labeling (similar to current European standards), consumer awareness of current GMO labeling is low. A distinction must also be made between GMO familiarity and scientific understanding, because those who are more familiar with it tend to be more resistant to bioengineering, whereas those with higher scientific knowledge scores tend to have less negative attitudes toward GMOs (Wunderlich, & Gatto, 2015). Also a study conducted on Chinese consumers (n=160) assessing the perception of toward GMO resulted in 11.9, 41.4, and 46.7% of respondents having a positive, neutral, or negative view on GMO food (Cui& Shoemaker, 2018).When assessing the parents perception toward organic versus conventional, Around half of parents chose organic baby food over

conventional while 47 % are willing to buy organic baby food the results were similar to the findings reported in a Turkish study by Ramalingam, (2021) on the purchasing behavior in terms of organic and willingness to buy organic baby food. The results show no deep association exists between income and willingness to pay high for organic food products, a deep association exists between education and willingness to pay high for organic food products

Among the factors affecting the purchasing behavior, food safety including microorganism, GMO, additive was selected among more than 65% of the parents living in Lebanon. In a study conducted by Kim et al., 2018 on the changes in Korean Consumers' perception on food preservatives considered food safety (44.8%) as the most important factor while purchasing processed foods. They still perceived food additives as the most hazardous one (41.5%), and among those, food preservatives were the most concerned (45.9%). Total 67.7% of the respondents considered the consumption of food preservatives as hazardous or very hazardous. However, 90.6% of respondents did not have any educational experience about food additives and food preservatives. Similar to this study that shows no correlation between purchasing behaviors related to food additives and education level employment, income ($p > 0.05$).

Health and wellness is the foremost important trend in the baby care and food sector, and this trend is broken down in different ways. Natural and organic claims are often popular among parents, for example, due to the claims' associated health benefits and premium positioning. Global Data's 2021 Q3 consumer survey found that 75% of global consumers

found that organic claims in food and drink products were somewhat or very appealing. Similarly, 76% of consumers globally, said the same about products that have non-GMO claims (Retail insights,2021) Similar to the results of this paper which shows a kind of correlation between education and choosing free GMO and organic baby food

In the Lebanese market, the most prevalent brands include Hipp, Bledina and Nestle: Cereal. Also internationally these brands were considered the most common (IFT.2003). This study also showed that highly educated parents are more aware about Bledina and Hipp as compared to Gerber and those with lower education.

Finally, around 72% of parents living in Lebanon are interested to buy local Lebanese baby food. It is good number since Lebanese meals are a great combination of most of the major food groups – carbohydrates, protein, fats and vegetables and Mediterranean diet is considered a good diet to follow. However, the 28 % chose that they wouldn't try local Lebanese made meals. This is maybe linked to not having trust in Lebanese baby food production and food safety standards. They would rather choose the international brands

5. Conclusion

The overall results showed that 72% of parents are WTP Lebanese baby food. The price, safety, and nutrition are the most important factors looked for in these products. The educational level, employment status affects the purchasing behaviors. The results of this study obtained in this study even through were based on a small sample size, can be generalized to the Parents living in Lebanon since it was done on parents from all around the

region and not localized from one place. These findings can help in production of new baby food based on the perception, preferences of parents toward baby food. These results could be contaminated to policy makers to insure in order to avoid health problems and undernutrition

Limitations

Due to the worldwide pandemic, this study has several limitations. The questionnaire had to be addressed through online survey, and interview for Syrian parents was limited to a small size, parents of babies between 0 to 3 years old only were taken as participants which greatly reduced the sample size and did not help person contact.

In addition to covid 19, Lebanon has been going through the worst economic crisis in terms of electricity, internet problems, fuel shortage.

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