Universal Journal of Public Health 11(3): 332-341, 2023
DOI: 10.13189/ujph.2023.110307

Analysis of Critical Beliefs in Diverse Complementary Food Intervention Using Planned Behavior Theory

Wida Winarno[1,*], Sandra Fikawati[1], Rita Damayanti[1], Ahmad Syafiq[1], Marthin Nanere[2], Amadeus Driando Ahnan-Winarno[3]

[1]Faculty of Public Health, Universitas Indonesia, Indonesia
[2]Department of Economics, Finance and Marketing, La Trobe Business School, La Trobe University, Australia
[3]Indonesian Tempe Movement, Indonesia

Received March 3, 2023; Revised May 21, 2023; Accepted June 11, 2023

Cite This Paper in the Following Citation Styles

(a): *[1] Wida Winarno, Sandra Fikawati, Rita Damayanti, Ahmad Syafiq, Marthin Nanere, Amadeus Driando Ahnan-Winarno , "Analysis of Critical Beliefs in Diverse Complementary Food Intervention Using Planned Behavior Theory," Universal Journal of Public Health, Vol. 11, No. 3, pp. 332 - 341, 2023. DOI: 10.13189/ujph.2023.110307.*

(b): *Wida Winarno, Sandra Fikawati, Rita Damayanti, Ahmad Syafiq, Marthin Nanere, Amadeus Driando Ahnan-Winarno (2023). Analysis of Critical Beliefs in Diverse Complementary Food Intervention Using Planned Behavior Theory. Universal Journal of Public Health, 11(3), 332 - 341. DOI: 10.13189/ujph.2023.110307.*

Abstract Diverse complementary foods (DCF) play a significant role in meeting the nutritional needs of infants aged 6-23 months to avoid malnutrition. However, local beliefs (e.g., socioeconomic, and religious beliefs) can determine the success of such public health intervention programs, especially in highly diverse regions. Selecting the most critical factors in the community to undergo intervention programs is also tricky. This study investigated mothers' beliefs in providing DCF to evaluate their understanding of the importance of DCF with purposive sampling. A quasi-experimental study involving forty-one mothers in a stunting-impacted area of Bogor, West Java, Indonesia, was undertaken. Data were obtained via 3-phase interviews conducted by trained enumerators until saturation condition was reached. For the first phase, the mother's beliefs were identified using questionnaires based on the Planned Behavior theory. The second phase separated the subjects based on their beliefs in giving DCF. The third phase was determining the significance of differentiating beliefs between the groups using a statistical T-test and pinpointing the most significant concerns. Based on their practical understanding, twenty-two mothers were classified as DCFs (mothers who made and served DCF containing fresh ingredients to their infants) and nineteen as non-DCFs. The seven most differentiating core beliefs were identified: the factors of economy, children's pickiness in eating, husband's support, motivation, instant food consumption, places to shop, and availability of various foods around the house. This study demonstrated that distilling critical intervention points, i.e., core beliefs in complex public health interventions, can be done by applying the Planned Behavior theory.

Keywords Beliefs, Dietary Diversity, Planned Behavior, Communication Strategy, Intervention

1. Introduction

Adequate complementary feeding practices are critical for children's health, growth, and development [1]–[3]. Nutrition intake in the first two years of a baby is vital in human life [4], [5]. Inadequate food intake at months 6-23 is associated with growth faltering, resulting in increased risks of stunting [6], [7]. Babies depend on their mother or caregiver during complementary feeding periods to give them food [3]. The complementary food period is also a time for forming eating habits and developing a good appetite [6]. Caregivers' knowledge, time availability, household dynamics, and social norms determine infant and young child feeding practices [8].

The Minimum Dietary Diversity (MDD) and Minimum Acceptable Diet (MAD) provide guidelines to help children consume diverse food and are given food at an adequate frequency [9]. The World Health Organization

(WHO) recommends various foods to consume to meet a baby's need for protein, calories, carbohydrates, fats, and micronutrients for optimal growth and development [5], [6], [10]. UNICEF recommends a diverse diet for children 6-23 months of age with MDD [11], consuming at least 5 of the eight food groups the previous day. The eight groups of food are 1) breast milk, 2) grains, roots, and tubers, 3) legumes and nuts, 4) dairy products, 5) flesh foods (e.g., meat, poultry, fish, and liver/organ meats), 6) eggs, 7) vitamin A rich fruits and vegetables 8) other fruits and vegetables [4]. The Ministry of Health of Indonesia suggests that infants and young children consume four food groups daily: staple food, protein source food (flesh, dairy, eggs, nuts), vegetables, and fruits to complement breast milk [12].

Globally, less than 20% of babies at 6-23 months of age in low- and middle-income countries consume foods that meet the standard of MAD [13], while less than 15% of babies aged 6-11 months meet the MDD standard [13]. Based on the Indonesian National Basic Health Research/Riset Kesehatan Dasar in 2018, 30.8% of all children were stunted [14]. The Indonesian Ministry of Health reported that based on the Toddler Nutritional Status Survey/Studi Status Gizi Balita in 2021, the prevalence of underweight children was 16.29%, and the prevalence of stunting and wasting were 27.67% and 7.44%, respectively [15]. Diet quality, particularly dietary diversity, is associated with children's nutritional status [16]. Improving the dietary variety of children's diets provided through improving complementary feeding practices [17].

Feeding practices are specific behavioral strategies that parents employ to control the quality, quantity, and timing of their child's food intake and eating behavior [18]. Mothers' beliefs, attitudes, and behavior are associated with complementary feeding practices [19]. Investigating the mother's salient behavior in feeding practices will improve understanding of the mechanism of the mother's changing behavior [19]–[21]. One of the most popular and commonly used theories in research on behavior modification is the Theory of Planned Behavior (TPB). According to the theory of planned behavior, human action is influenced by three major factors: a favorable or unfavorable evaluation of the behavior (attitude toward the behavior), perceived social pressure to perform or not perform the behavior (subjective norm), and perceived capability to perform the behavior (perceived behavioral control) [22, p.316].

The Planned Behavior Theory describes the underlying infant feeding behavior, which can help determine the targets and key approaches for feeding interventions [23]. Intervention in structured nutrition education based on a proven theory has the chance for more successful implementation and improves people's trust in education [24].

For complementary interventions, the UNICEF guidance suggested conducting a situation analysis to understand the status and objectives of the infant's diet and to determine priority actions that must be carried out [3]. As an archipelago, Indonesia is a highly diverse country with more than 17,000 islands and more than 300 ethnic groups with their own beliefs [25]. Given the elevated level of diversity, analyzing the local beliefs for complementary feeding intervention is critical. Each area had specific economic and socio-cultural conditions, including the availability and affordability of nutritious and diverse food and the enabling and inhibiting factors in providing adequate complementary feeding, including the mother's behavior at the household level [3].

The city of Bogor has located only 60 km from Jakarta the capital city of Indonesia - Southeast Asia. However, Bogor City had significant challenges in children's health. In 2021-2022, the mean prevalence of stunting in children aged 6-23 months was 22.57% in Bogor City, in which ten of the 68 sub-districts in Bogor City had the highest prevalence rates [26]. While the overall prevalence of stunting in Bogor is lower than the national prevalence (30.8%), it is still much higher than the national target of 14% [27]. This stunting prevention program was undertaken as part of an effort to reach that target.

The study aims to investigate mothers' underlying beliefs that affect their decisions toward diverse complementary feeding (DCF) practices for their children aged 6-11 months. Understanding their beliefs will help to improve the effectiveness of the stunting prevention program.

2. Methods

Qualitative and quasi-experimental research was conducted to identify the belief factors of mothers in Bogor City, Indonesia. The study was conducted for three months, from January to March 2021, using one-to-one phone call interviews due to the Corona Virus (COVID-19) pandemic. The participants comprised forty-one mothers with one child aged 6-11 months living in an urban area. The mothers had senior high school education. Participants were selected with a purposive sampling method based on subjective and practical considerations following the criteria that they were giving their child complementary food. The study was the preliminary study to support the leading research in developing the nutrition education program.

The study was conducted in 3 phases, as Ham et al. [28] reported. The questionnaires for Phase I was developed by Fishbein [28] to assess TPB belief. The questions for behavioral beliefs were: Question 1 (advantages): What do you see as the advantages of giving diverse complementary foods? Question 2 (disadvantage): What do you see as the disadvantages of providing diverse complementary foods? Two questions for normative beliefs: Question 3 (supportive): Who are the people who support you in giving diverse complementary foods? Question 4 (not giving support): Who does not support mothers giving diverse

complementary foods? Two questions for control beliefs: Question 5 (enabler): What do you consider things that make it easier to provide diverse complementary foods? Question 6 (barrier) What do you consider the difficulty in giving diverse complementary foods? All the answers of the questions are shown in Figure 1.

Phase II used the questionnaires of TPB modified by Ham et al. [29] to identify and decide which beliefs were selected to add to Phase III. At this phase, belief labels were chosen to distinguish DCFs from non-DCFs and to improve communication effectiveness in intervention. The DCFs are defined as mothers who made and served DCF containing fresh ingredients to their infants, and the non-DCFs are those who did the contrary. Phase III started with collecting data from participants identified as DCFs or non-DCFs member groups. The pilot-tested questionnaires were executed among the participants until they reached saturation. Data were collected to measure each group's belief strength levels and evaluation ranges of each group.

All the questionnaires were translated into Indonesian, reviewed by nutrition and communication experts, and then pilot-tested before use. Probing and a 5-Likert scale questionnaire were used until the answers reached saturation. Interview transcripts were analyzed based on belief labels and evaluated by the nutrition and communication expert's panel. Three enumerators with the degrees of bachelor's in nutrition were trained to perform data collection.

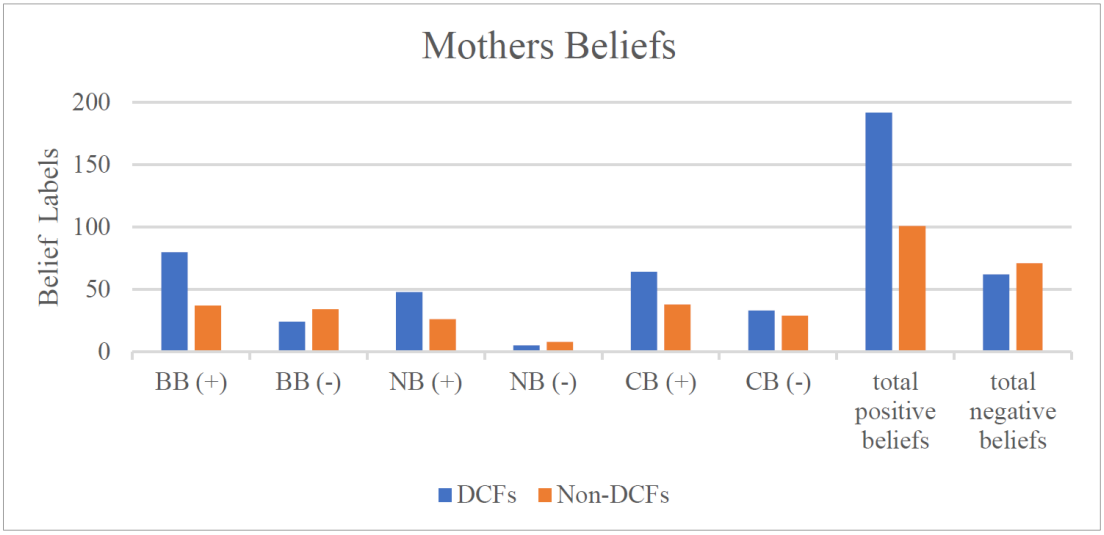
This study identified mothers into the groups of DCFs or non-DCFs based on their practical preferences in giving their children DCF to the Ministry of Indonesia's recommendation of giving four food groups per day: staple food, protein source food (flesh, dairy, eggs, nuts), vegetables, and fruits to complement the breast milk [30].

Descriptive statistics were used to identify the difference between groups. The three most significant belief labels were determined as the critical intervention points to communicate impactful, persuasive messages. The IBM SPSS Statistics for Windows version 25J were utilized to analyze an independent sample t-test to determine the significance between DCFs and non-DCF groups ($p < 0.05$).

3. Results

Phase I identified the belief labels for mothers; there were 117 labels for Question 1 [Behavioral Beliefs = BB (+)]; 80 labels for DCFs and 37 labels for Non-DCFs. Fifty-eight labels for Question 2 [Behavioral Beliefs =BB(-)], 74 labels for Question 3 [Normative Beliefs = NB (+)], 13 labels for Question 4 [Normative Beliefs (-)], 103 for Question 5 [Control Beliefs (+)], and 62 labels for Question 6 [Control Beliefs (-)] as seen in Figure 1.

Phase II identified the different beliefs between the groups of DCFs and non-DCFs. The DCFs tend to have more positive beliefs than the non-DCFs (Figure 1). The next step was reviewing the belief labels that will add to phase III, which have the potential to be persuasive messages on the intervention. DCFs reported 192 positive answers (advantages, support, enable) than non-DCFs (101 labels). Negative beliefs (disadvantages, not support, inhibit) were mentioned more by the non-DCFs group (71 labels) than the DCFs group (62 labels), as seen in Figure 1. Most DCFs thought differently from non-DCFs; some beliefs contradict both groups, as seen in Table 1 and Table 2. DCFs believed that DCF would save them money, while non-DCFs thought it was the opposite. DCFs believed DCF is easy to cook, while non-DCFs believed that making DCF is complicated and troublesome, making mothers feel lazy to make it. DCFs believed that making DCF only needed simple kitchen equipment, but non-DCFs believed the contrary.



BB=Behavioral Beliefs, NB=Normative Beliefs, CB=Control Beliefs, (+) =positive beliefs, (-) =negative beliefs, DCFs=Mothers who provide DCF, Non-DCFs=mothers who do not provide DCF.

Figure 1. Mothers' Beliefs in Providing DCF in Bogor City, Indonesia

We sorted the data into twelve fundamental beliefs with the highest percentage, as seen in Table 1 and Table 2. Table 1 shows the most significant difference is the normative belief (32%), in which the husband is the most supportive person to the mother in providing DCF. Table 2 focuses on the non-DCF group, and the most significant difference is control belief which, in the non-DCFs perspective giving their child complementary commercial food is more convenient.

The average strength and belief assessment range value for every selected label will be calculated by multiplying the belief strength mean score and the evaluation range mean score; the result was the cross-product range for each belief label. The difference in the mean cross-product between the DCFs group and the non-DCFs group was calculated as presented in Table 3. The value of the most significant difference will be used as a persuasive message in the intervention.

Table 3 shows that the most significant difference between DCFs and non-DCFs (9.22) was the belief that "making diverse complementary food is troublesome." The second most notable difference was the label "making complementary food which is appropriate for children's age" (7.56), while the third was "accessibility to information about DCF" (5.94)

The study found that besides the score, accessibility to DCF information belief (5.94) is close to simple equipment belief (5.67) and food quality belief (5.06). The five beliefs should be put into consideration to developing an intervention. The T-test analysis results indicate the significant difference between the two groups, which is shown in Table 4. Seven beliefs significantly differed between the two groups, behavioral beliefs: 1)"economic constraint" 2)"didn't want my child to become the picky eater in the future." Normative beliefs: 3)"husband support" and for control beliefs: 4) "feeling lazy in making diverse complementary food," 5)"instant food and street food are inexpensive and convenient," 6)"shopping facilities" and 7)"access to ingredients for DCF."

Table 1. Highest Percentages of Beliefs Label Mentioned by DCFs Group of Mothers in Bogor City, Indonesia

No	Belief label	DCFs (n=22)	Non-DCFs (n=19)	Difference between DCFs & Non-DCFs
Behavioral Beliefs				
1	Improving my child's health	11 (50%)	8 (42%)	8%
2	Children did not become the "picky eater"	8 (36%)	1 (5%)	31%
3	Giving my child the required nutritional intake	8 (36%)	4 (21%)	15%
4	DCF can save money	5 (23%)	0 (0%)	23%
Normative Beliefs				
5	Husband/spouse support	21 (95%)	12 (63%)	32%
6	Mother/parent support	14 (64%)	9 (47%)	17%
Control Beliefs				
7	DCF can be made with simple kitchen equipment	14 (64%)	7 (37%)	27%
8	Easy to find the ingredients	13 (59%)	6 (32%)	27%
9	Easy to cook	10 (45%)	4 (21%)	24%
10	Need extra time to make DCF	8 (36%)	7 (37%)	1%
11	Shopping from the local shop around the house	7 (32%)	4 (21%)	9%
12	Children do not like to eat food cooked by mothers	7(32%)	5(26%)	6%

Notes: DFC = Diverse Complementary Food, DCFs=Mothers who provide DCF, Non-DCFs=mothers who do not provide DCF.

Table 2. Highest Percentages of Beliefs Labels Mentioned by Non-DCFs Group of Mothers in Bogor City, Indonesia

No	Belief label	DCFs (n=22)	Non-DCFs (n=19)	Difference between DCFs & Non-DCFs
Behavioral Beliefs				
1	Improving my child's health	11 (50%)	8 (42%)	8%
2	Children do not want to eat food cooked by mothers	7 (32%)	5 (26%)	6%
4	Wasting food because children did not like it	0%	4 (21%)	21%
5	Household spending increase	1 (5%)	4 (21%)	16%
3	Wasting money	0%	3 (16%)	16%
Normative Beliefs				
7	Parents did not support DCF	14 (64%)	9 (47%)	17%
6	The husband did not support DCF	0 (0%)	4 (21%)	21%
Control Beliefs				
8	Commercial complementary food is more convenient	0 (0%)	10 (53%)	53%
9	Making DCF is taking extra time	8 (36%)	7 (37%)	1%
10	Making DCF is complicated	4 (18%)	6 (32%)	14%
11	Making DCF is troublesome, feeling lazy to make it	0 (0%)	4 (21%)	21%
12	Cooking equipment constraints	0 (0%)	2 (11%)	11%

Notes: DCF=Diverse Complementary Food, DCFs=Mothers who provide DCF, Non-DCFs=mothers who do not provide DCF.

Table 3. Selection of Mother's Belief for Persuasive Messages

Mother's belief in Providing DCF	Mean Belief Strength (Range: Zero to +6)		Mean Evaluation (Range: -3 to +3)		Mean Cross Product (Range: -18 to 18)		Difference between DCFs & Non-DCFs
	DCFs	Non-DCFs	DCFs	Non-DCFs	DCFs	Non-DCFs	
Behavioral Beliefs							
Children nutrition fulfilled & healthy	6.00	5.11	3.00	3.00	18.00	15.33	2.67
Children eat voraciously and do not become the picky eater	5.22	4.00	3.00	3.00	15.67	12.00	3.67
More efficient	5.33	5.33	3.00	2.72	16.00	14.56	1.44
Food quality & safety	6.00	4.78	3.00	2.17	18.00	12.94	5.06
Making DCF is troublesome	2.67	3.50	2.22	0.06	5.67	-3.56	9.22
Normative Beliefs							
Friends support	5.44	5.06	0.17	0.28	1.56	1.50	0.06
Control Beliefs							
Food ingredients are easy to obtain from stalls/vegetable vendors around the house.	5.39	5.56	2.78	2.44	15.83	13.89	1.94
Need Simple equipment for making DCF.	5.67	5.33	2.83	1.83	17.00	11.33	5.67
Accessibility to information about DCF	6.00	5.11	3.00	1.94	18.00	12.06	5.94
Making food that suitable for child's age is difficult	5.61	5.44	1.89	0.33	11.22	3.67	7.56

Notes: DCF=Diverse Complementary Food, DCFs=Mothers who provide DCF, Non-DCFs=mothers who do not provide DCF.

Table 4. Differences of Behavioral Beliefs, Normative Beliefs, and Control Beliefs of DCFs and Non-DCFs Group of Mothers in Bogor City, Indonesia

Mother's Beliefs	DCFs		Non-DCFs		P-Value
	Mean	SD	Mean	SD	
Behavioral Beliefs					
Mother likes to give their child instant food	0.42	0.51	0.27	0.46	0.33
Children know the original taste of food	0.05	0.23	0.36	0.49	0.13
Economic constraint	0.05	0.23	0.50	0.51	**0.01***
Food safety & hygiene sanitation	0.05	0.23	0.27	0.46	0.55
Defecation problem	0.00	0.00	0.05	0.21	0.36
Did not want their child to become the "picky eater" in the future	0.05	0.23	0.41	0.50	**0.01***
My child will have a good appetite	0.16	0.37	0.32	0.48	0.24
Good Child development	0.58	0.51	0.45	0.51	0.44
Diverse complementary foods are troublesome	0.63	0.50	0.55	0.51	0.59
Child nutrition is fulfilled	0.53	0.51	0.77	0.43	0.11
Normative Beliefs					
Husband support	1.00	0.00	0.68	0.28	**0.01***
Parents support	0.73	0.46	0.53	0.52	0.20
Relatives support	0.32	0.48	0.11	0.32	0.10
Friends support	0.36	0.49	0.21	0.42	0.30
Control Beliefs					
Equipment for making food	0.47	0.52	0.73	0.46	0.102
Information about diverse complementary food	0.00	0.00	0.18	0.39	0.052
Making process	0.26	0.45	0.55	0.51	0.070
Feeling lazy in making diverse complementary food	0.47	0.52	0.00	0.00	**0.000***
Instant food and street food are inexpensive and convenient	0.47	0.51	0.46	0.21	**0.001***
Affordability	0.11	0.32	0.05	0.21	0.489
Time ability	0.11	0.32	0.41	0.50	0.290
Child's taste	0.26	0.45	0.45	0.51	0.214
Shopping facilities	0.53	0.52	1.00	0.00	**0.000***
Access to ingredients for DCF	0.00	0.00	0.27	0.46	**0.013***

Notes: *p-value < 0.05, DCF=Diverse Complementary Food, DCFs=Mothers who provide DCF, Non-DCFs=mothers who do not provide DCF.

4. Discussion

The most significant difference between the DCFs and non-DCFs (9.22) is the label "making diverse complementary food is troublesome." This finding is consistent with other information stating that "feeling lazy in making diverse complementary food," "wasting time," "wasting money," and the belief that "giving their child instant food or street food" was much more convenient for non-DCFs. This result was supported by Karimi-Shahanjarini [31], who mentioned "not enough time" is the firm belief of mothers in Rasht City, Iran [31]. Time constraints became the barrier since the mother's time was taken by other activities, leaving limited time and energy for childcare [3]. DCFs and non-DCFs have the same belief about the time spent making DCF; the difference is that the DCFs know how to make it efficiently and keep providing DCF.

The second most significant difference is the label "making complementary food which is appropriate for children's age is difficult" (7.56), which shows that mothers should consider the consistency of the food. Making the porridge, solid food, and soft food appropriate for babies requires additional equipment, which aligns with the label "needing some equipment" (5.67). A study conducted in an urban area in Jakarta emphasized that low education and inadequate knowledge about appropriate food and feeding practices are more significant predisposing factors

regarding complementary practices among 9-11 month-old infants [32]. Knowing how to make complementary food with simple kitchen tools should be introduced to mothers in educating complementary feeding practices.

One of the WHO recommendations on addressing the inappropriate promotion of foods for infants and young children was to promote guiding principles for complementary feeding and feeding non-breastfed children aged 6-24 months, emphasizing nutrient-rich, home-prepared and home-prepared, and local foods [33]. The most significant difference in control belief was the "feeling lazy to make DCF." It was supported by the presence of instant food and street food, which non-DCFs believed was inexpensive and more convenient than providing DCFs themself. Sponsored by the belief of economic constraints and time-consuming findings for this study, in Bogor City, DCF competes with street food & instant porridge. Encouraging messages to conquer mothers' laziness while improving mother knowledge about nutrient density in DCF has the potential to persuade better feeding practices.

The third most significant score difference was the label "access to information about diverse complementary food" (5.94), which describes that mothers need information about complementary foods. DCFs believed that knowledge was accessible, while non-DCFs thought differently. A study in 2018 in Jigjiga Town, Ethiopia, found that mothers in the urban city know that they should diversify the main menu for their child; however, mothers' knowledge of complementary feeding practices was not significantly related to their feeding practices (>0.05). Assessing the cultural beliefs of infants and young children's feeding practices should be conducted to understand the patterns [34].

In this study, the father's support was essential for mothers to provide diverse complementary food (DCF). In Laishui County China, [23] normative beliefs figure that the mother-in-law is the most decisive influence in giving complementary foods. In Lake Zone, Tanzania, education focusing on the father enhances the father's function to support various complementary feeding programs [1]. Husbands are also essential in feeding practices [1], [20]. Father's Early Breast Feeding (EBF) education program increased the mother's EBF intention [35]. The husband also plays a vital role in providing the money to buy diverse food supported by poor dietary diversity in the urban-slum area in Bangalore, India, related to the low monthly household income [36]. The economic constraint mentioned by Deshmukh [36] is also associated with poor dietary diversity.

The DCFs and non-DCF groups have similar beliefs; both feel unconfident since children often refuse their mother's cooking. Identical to Spinks [37], "resistance from my child" is also found in behavioral beliefs for healthy eating. Eating behavior was shaped by the mother's capacity to provide a nurturing environment. Maternal self-efficacy is strongly associated with the mother's ability to provide an encouraging environment for healthy feeding practices, not only through the food they offer but also through parents eating behaviors [18], [38].

Such foods' availability, access, affordability, and desirability drive a child's adequate diet. The limited availability of nutritious food is a barrier to consumption, even when caregivers can afford such foods [3]. Bogor City is a fertile area with a friendly climate for plants so that various food crops can grow well. Since it is an urban area, food should not have been foraged like in rural areas [39], [40]. Many small shops (warung) sell various food ingredients for DCF; however, caregivers' knowledge and purchasing power drive the decision to choose the food. Most of the household income is allocated to staple food; thus, less for meat source food [41], [42].

UNICEF suggests food safety by providing complementary food [43]. The DCFs were concerned about this, while non-DCFs did not take it seriously. Table 4 shows that the T-test did not significantly differ between DCFs and non-DCFs. The coronavirus pandemic taught people to be more conscious about hygiene and sanitation. Food safety has become a daily habit more than in the past, as well as preparing more hygienic food for infants for some mothers [44]

Guiding from older relatives and cultural food practices limits mothers' choices in complementary feeding practices. Mothers fear gas and indigestion from green leafy vegetables and cold from citrus fruit [45]. The misleading traditional attitude that protein source food like fish, egg, and tempeh are not suitable for the child is also found in the Bogor city community. These cultural beliefs limit mothers from offering nutritious, local, and affordable foods.

A limitation of this study is that the data collection was taken during the COVID-19 pandemic; thus, the interview was done by one-to-one calling instead of face-to-face, limiting the depth of information gathered. The enumerators trained about the situation and attempted to maximize the information.

5. Conclusions

This study identified significant differentiating beliefs (positive and negative) between non-DCFs from DCFs groups. Non-DCFs mothers should be the primary target for intervention. The most critical negative beliefs should be the focus for designing communication strategy in intervention, while the most significant positive beliefs can be used to motivate non-DCFs mothers. The belief that 'providing DCF is trouble, challenging, and requires cooking equipment' should be addressed in the upcoming relevant intervention education programs, such as through more detailed and practical ways to provide DCF. The husband's involvement is also critical, and understanding husbands' beliefs could lead to exciting findings for future studies.

Abbreviations

DCF: Diverse Complementary Food; EBF: Early Breast Feeding; MAD: Minimum Acceptable Diet; MDD: Minimum Dietary Diversity; UNICEF: United Nations Children's Fund; WHO: World Health Organization; COVID-19: coronavirus disease 2019

Ethics Approval and Consent to Participate

The Commission for Research Ethics and Public Health Service, Faculty of Public Health, Universitas Indonesia has approved this study number: 573/UN2.F10. D11/ PPM.00.02/ 2021

Competing Interests

The author declares that no significant competing financial, professional, or personal interest might have affected the performance or presentation of the work defined in this manuscript.

Authors' Contribution

WW designed, conceptualized, collected, and analyzed the data. RD & SF together directed and supervised this study and approved this manuscript. AS, MN, and ADA overviewed the manuscript.

Acknowledgements

The authors would like to thank the Vice Major of Bogor, Head of Health Bogor City, for the permission. The authors acknowledge Anies Irawati, Juhaeri Muchtar, and Susiana Nugraha for their comments and suggestions. The authors thank the respondents and enumerators for their contribution and commitment.

REFERENCES

[1] S. L. Martin *et al.*, "Engaging fathers to improve complementary feeding is acceptable and feasible in the Lake Zone, Tanzania," *Matern. Child Nutr.*, vol. 17, no. S1, p. e13144, Jul. 2021, doi: 10.1111/MCN.13144.

[2] J. M. White, F. Bégin, R. Kumapley, C. Murray, and J. Krasevec, "Complementary feeding practices: Current global and regional estimates," *Matern. Child Nutr.*, vol. 13, Oct. 2017, doi: 10.1111/MCN.12505.

[3] UNICEF, Improving Young Children's Diet during the Complementary Feeding Period. New York: UNICEF, 2020.

[4] F. Bégin and V. M. Aguayo, "First foods: Why improving young children's diets matter," *Matern. Child Nutr.*, vol. 13 Suppl 2, no. Suppl 2, Oct. 2017, doi: 10.1111/MCN.12528.

[5] V. M. Aguayo and P. Menon, "Stop stunting: improving child feeding, women's nutrition and household sanitation in South Asia," *Matern. Child Nutr.*, vol. 12, pp. 3–11, May 2016, doi: 10.1111/MCN.12283.

[6] C. G. Victora, M. De Onis, P. C. Hallal, M. Blössner, and R. Shrimpton, "Worldwide timing of growth faltering: revisiting implications for interventions," *Pediatrics*, vol. 125, no. 3, Mar. 2010, doi: 10.1542/PEDS.2009-1519.

[7] V. M. Aguayo, "Complementary feeding practices for infants and young children in South Asia. A review of evidence for action post-2015," *Matern. Child Nutr.*, vol. 13, Oct. 2017, doi: 10.1111/MCN.12439.

[8] Garg *et al.*, "NUTRITION GUIDANCE SERIES UNICEF PROGRAMMING GUIDANCE Improving Young Children's Diets During the Complementary Feeding Period," 2020.

[9] L. Diop, E. Becquey, Z. Turowska, L. Huybregts, M. T. Ruel, and A. Gelli, "Standard Minimum Dietary Diversity Indicators for Women or Infants and Young Children Are Good Predictors of Adequate Micronutrient Intakes in 24-59-Month-Old Children and Their Nonpregnant Nonbreast feeding Mothers in Rural Burkina Faso," *J. Nutr.*, vol. 151, no. 2, pp. 412–422, Feb. 2021, doi: 10.1093/jn/nxaa360.

[10] Brown and H. Rowan, "Maternal and infant factors associated with reasons for introducing solid foods," *Matern. Child Nutr.*, vol. 12, no. 3, pp. 500–515, Jul. 2016, doi: 10.1111/MCN.12166.

[11] Garg *et al.*, "NUTRITION GUIDANCE SERIES UNICEF PROGRAMMING GUIDANCE Improving Young Children's Diets During the Complementary Feeding Period."

[12] Kemenkes RI, *Buku KIA (Kesehatan Ibu dan Anak)*. Jakarta: Erlangga, 2019.

[13] UNICEF, "From the First Hour of Life: Making the case for improved Infant and Young Child Feeding Everywhere," New York, 2016.

[14] Kementrian Kesehatan RI Badan Penelitian dan Pengembangan Kesehatan, "Indonesia National Basic Health Research 2018," Jakarta, 2019.

[15] Indonesian Ministry of Health, "Studi Status Gizi Balita," Studi Status Gizi Balita, 2021. https://www.litbang.kemkes.go.id/materi-launching-hasil-studi-ssgi-tahun-2021/.

[16] M. Arimond and M. T. Ruel, "Dietary diversity is associated with child nutritional status: evidence from 11 demographic and health surveys," *J. Nutr.*, vol. 134, no. 10, pp. 2579–2585, 2004, doi: 10.1093/JN/134.10.2579.

[17] G. Gatica-Domínguez, P. A. R. Neves, A. J. D. Barros, and C. G. Victora, "Complementary Feeding Practices in 80 Low-and Middle-Income Countries: Prevalence of and Socioeconomic Inequalities in Dietary Diversity, Meal Frequency, and Dietary Adequacy," *J. Nutr.*, vol. 151, no. 7, pp. 1956–1964, Jul. 2021, doi: 10.1093/jn/nxab088.

[18] J. Klosowska, S. Verbeken, C. Braet, S. De Henauw, and N. Michels, "Emotion Regulation Moderates the Associations of Food Parenting and Adolescent Emotional Eating," 2022, doi: 10.1016/j.jneb.2022.05.002.

[19] M. Horodynski, B. Olson, M. J. Arndt, H. Brophy-Herb, K. Shirer, and R. Shemanski, "Low-income mothers' decisions regarding when and why to introduce solid foods to their infants: Influencing factors," *J. Community Health Nurs.*, vol. 24, no. 2, pp. 101–118, 2007, doi: 10.1080/07370010701316247.

[20] T. Spinks and K. Hamilton, "Investigating key beliefs guiding mothers' dietary decisions for their 2-3-year-old," *Appetite*, vol. 89, pp. 167–174, 2015, doi: 10.1016/j.appet.2015.02.004.

[21] Karimi-Shahanjarini, F. Rahmani, G. Roshanei, and S. M. Mahdi Hazavehei, "Assessment of Salient Beliefs Affecting Mothers' Intention to Adherence to Dietary Diversity in their Children's Complementary Feeding," *Int. J. Prev.* Med., vol. 8, Mar. 2017, doi: 10.4103/IJPVM.IJPVM_64_16.

[22] Ajzen and N. G. Cote, "Attitudes and The Prediction of Behavior," in *Attitudes and Attitude Change*, W. D. Crano and R. Prislin, Eds. New York: Psychology Press, 2008, p. 427.

[23] Zhang, L. Shi, D. Chen, J. Wang, and Y. Wang, "Using the theory of planned behavior to examine effectiveness of an educational intervention on infant feeding in China," *Prev. Med. (Baltim).*, vol. 49, no. 6, pp. 529–534, Dec. 2009, doi: 10.1016/J.YPMED.2009.10.002.

[24] S. Baker, G. Auld, A. Ammerman, B. Lohse, E. Serrano, and M. K. Wardlaw, "Identification of a Framework for Best Practices in Nutrition Education for Low-Income Audiences," *J. Nutr. Educ. Behav.*, vol. 52, no. 5, pp. 546–552, May 2020, doi: 10.1016/j.jneb.2019.12.007.

[25] "Jumlah Pulau di Indonesia Capai 17.000! | Indonesia Baik." https://indonesiabaik.id/infografis/jumlah-pulau-di-indonesia-capai-17000 (accessed Feb. 21, 2023).

[26] Kota Bogor, "Program Konvergensi dalam Penanggulangan Stunting," Bogor, 2022.

[27] "Kementerian Pendayagunaan Aparatur Negara dan Reformasi Birokrasi - Presiden: Target Angka Prevalensi Stunting Di Bawah 14 Persen pada 2024 Harus Tercapai." https://menpan.go.id/site/berita-terkini/dari-istana/presiden-target-angka-prevalensi-stunting-di-bawah-14-persen-pada-2024-harus-tercapai (accessed Feb. 21, 2023).

[28] M. Fishbein and I. Ajzen, *Predicting and changing behavior the reasoned action approach*. New York: Psychology Press, 2011.

[29] S. H. Ham, T. J. Brown, J. Curtis, B. Weiler, M. Hughes, and M. Poll, *Promoting Persuasion in Protected Areas*. 2009.

[30] Kementrian Kesehatan RI, Buku Kesehatan Ibu dan Anak (Buku KIA). 2016.

[31] Karimi-Shahanjarini, F. Rahmani, G. Roshanei, and S. M. Mahdi Hazavehei, "Assessment of Salient Beliefs Affecting Mothers' Intention to Adherence to Dietary Diversity in their Children's Complementary Feeding," *Int. J. Prev. Med.*, vol. 8, pp. 8–28, Mar. 2017, doi: 10.4103/IJPVM.IJPVM_64_16.

[32] Septriana and G. A. Suhartono, "Predisposing factors of complementary feeding practices among 9-11 month-old infants in Jakarta urban slum area," *Kesmas*, vol. 10, no. 3, pp. 127–133, 2016, doi: 10.21109/KESMAS.V10I3.948.

[33] WHO, Guidance on Ending the inappropriate promotion of foods for infants and young children: implementation manual. Switzerland, 2017.

[34] Y. Mihretie, "Maternal Knowledge on Complementary Feeding Practice and Nutritional Status of Children 6-23 Month in Jigjiga Town," *Glob. J. Nutr. & Food Sci.*, vol. 1, no. 1, 2018, Accessed: Jan. 10, 2023. [Online]. Available: https://www.academia.edu/39366444/Maternal_Knowledge_on_Complementary_Feeding_Practice_and_Nutritional_Status_of_Children_6_23_Month_in_Jigjiga_Town.

[35] S. O. Ajike, "Effect of a breastfeeding educational program on fathers' intention to support exclusive breastfeeding: A quasi-experimental study," *Afr. J. Reprod. Health*, Jan. 2020, doi: 10.29063/AJ.

[36] U. Deshmukh, J. R. A. M. 444005, I. BioTRaK Research Foundation, T. Thomas, S. Swaminathan, and A. Kurpad, "Breastfeeding Practices and Dietary Diversity among Infants and Young Children in Rural and Urban-Slum Populations in India: An Observational Study," *Int. J. Child Heal. Nutr.*, vol. 7, no. 4, pp. 175–183, Nov. 2018, doi: 10.6000/1929-4247.2018.07.04.7.

[37] T. Spinks and K. Hamilton, "Investigating key beliefs guiding mothers' dietary decisions for their 2-3-year-old," *Appetite*, vol. 89, pp. 167–174, 2015.

[38] R. Kolopaking, S. Bardosono, and U. Fahmida, "Maternal self-efficacy in the home food environment: a qualitative study among low-income mothers of nutritionally at-risk children in an urban area of Jakarta, Indonesia," *J. Nutr. Educ. Behav.*, vol. 43, no. 3, pp. 180–188, May 2011, doi: 10.1016/J.JNEB.2009.10.010.

[39] M. Ariani, A. Suryana, S. H. Suhartini, and H. P. Saliem, "KERAGAMAN KONSUMSI PANGAN HEWANI BERDASARKAN WILAYAH DAN PENDAPATAN DI TINGKAT RUMAH TANGGA Performance of Animal Food Consumption based on Region and Income at Household Level," vol. 16, no. 2, pp. 147–163, 2018.

[40] H. P. S. Rachman and M. Ariani, "PENGANEKARAGAMAN KONSUMSI PANGAN DI INDONESIA: PERMASALAHAN DAN IMPLIKASI UNTUK KEBIJAKAN DAN PROGRAM," 2008.

[41] Imelda, "Karakteristik dan Pola Konsumsi Pangan Rumah Tangga Masyarakat Kota Pontianak," *ETHOS (Jurnal Penelit. dan Pengabdian)*, vol. 6, no. 2, pp. 250–259, Jul. 2018, doi: 10.29313/ethos.v6i2.3441.

[42] Mayasari, D. Satria, and I. Noor, "Analisis Pola Konsumsi Pangan Berdasarkan Status IPM di Jawa Timur," *J. Ekon. dan Pembang. Indones.*, vol. 18, no. 2, pp. 191–213, 2018, doi: 10.21002/jepi.v18i2.801.

[43] M. White, F. Bégin, R. Kumapley, C. Murray, and J. Krasevec, "Complementary feeding practices: Current global and regional estimates," *Matern. Child Nutr.*, vol. 13, Oct. 2017, doi: 10.1111/mcn.12505.

[44] Estey, "INDONESIA SAVING LIVES CHANGING LIVES Vulnerability Analysis and Mapping (VAM) Unit-Indonesia Country Office," 2020.

[45] Bisht and V. Agarwal, "What's wrong with complementary feeding practices," *Santosh Univ J Heal.*, vol. 3, no. 2, pp. 71–73, 2017.