

# Nutrition Education Intervention in Selected Lebanese Nurseries - Procedures and Outcome

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**Abstract:** *The aim of this study is to determine the effectiveness of a multicomponent intervention program for nurseries' educators on nutrition status of children in 3 private and 1 public Lebanese nurseries. The multicomponent intervention program consisted of a nutrition education course, activities to be implemented with children and a parent session. The study enrolled 184 children and 30 caregivers at baseline, and 103 children and 25 caregivers post-intervention. Results showed a significantly higher percentage of children had an improved BMI with educators who attended the nutrition education sessions. This study may lay the foundation to develop core competencies for educators.*

**Keywords:** Nutrition Education, Educators, KVP model, NAYEC – DAP, BMI

## 1. Introduction

Early childhood development is crucial for later-life success [1; 2; 3; 4]. Biological and environmental sensitivity mark the first three years of life; during this period, children start to acquire basic however transformative developmental skills [5; 6]. Thus, this phase represents the optimal time to acquire good health and eating habits through education and intervention [7; 8].

Childhood obesity is a serious health problem that has adverse and long-lasting consequences for individuals, families, and communities. Efforts to prevent childhood obesity to date have focused largely on school-age children, with relatively little attention to children under age 5. Yet, children spend a considerable amount of time in childcare centers. As a result, these settings may have an influence on their diet, weight, and food security, and are potentially important contexts for interventions to address nutritional issues.

Nutrition interventions targeted the healthy nutrition need to occur early in childhood in order to prevent or reverse the adverse health effects of overweight and poor eating habits [9]. One way to promote healthy lifestyles and prevent obesity among children is through nutrition interventions that are essential to shape their nutrition behavior [10]. Population-based obesity prevention was shown to be efficient when performed in settings such as schools, preschools and childcare. Such activities help in encouraging healthy eating and physical activity for children [11].

Given that the majority of children in many countries spend approximately 30 hours per week in nurseries where they discover food forms, colors and textures in each meal; this environment represents a promising setting for nutrition intervention program to foster healthy behaviors in order to prevent and control childhood obesity [12].

In nurseries, the educators' nutritional awareness has a key role in food preferences development in nurseries and is an essential component to prevent obesity [13]. Educators should be consciously attempting to increase a child's preference for target foods; they should include variations on

repeated exposure, modeling, reward, pairing liked with disliked flavors, and structured teaching. High-quality early education produces long-lasting benefits (14). Thus the objective of this study is to correlate between nurseries' educators' knowledge, and practices in nutrition education and the nutrition status of children.

## 2. Literature Review

In fact, obesity is a wildly prevalent chronic pediatric disease [15]. From 1980 to 2010, obesity rate among children aged between 2 and 5 years has more than doubled in the USA [16]. Comparable results are also seen in children aged between 6 and 9 years in Lebanon where obesity rate has increased on average by 4.7% annually in 12 years [17]. In preschool years, dietary behaviors developed by children are crucial for their health development. More than 3/4 of children less than 5 years of age spend part or full day in childcare, which make this environment critical for promoting healthy behaviors [18].

The first 3 years of life are also fundamental stage in children food introduction and intake. Therefore, child's home and nursery must offer the recommended food quality and quantity that meet each child's nutritional needs [19; 20]. Eating habits, lifestyle and behavior patterns are developed in childhood and persist throughout adulthood [21]. Since taste preferences and food habits are learned [12; 22], early childhood is the perfect time to teach good eating habits [7].

Eating patterns are established early in life in response to internal regulatory cues, caregiver-child interactions, meal time's routines, foods offered and modeling from family members [23]; thus nurseries educators in coordination with parents are the key players in children development [24] and are responsible to adapt food consumption and to implement special feeding plans matching child's nutritional individualized needs and feeding skills [25].

Parents also act as main role models for children. Children have a tendency to follow their parents' eating habits. Expression of enjoyment when taking a bite of their children's food may encourage them to try it. On another

hand, in this rapid era of both working parents, the convenience revolution with pre-packed processed foods that form the basis of most home prepared meals; the “eating-out” trend has also increased [26], and the opportunity for children to acquire and improve basic food behavior at home is decreasing [27]. Family's eating habits and the type of food prepared by parents in daily time is also key to how infants choose their food [28]. Teaching parents about a healthy eating pattern for their children in home visiting or in nurseries could enhance the quality of the food offered and children's eating behavior [29].

Benjamin Neelon and Briley (2011) have stressed on the nutritional and health knowledge of nurseries educators as precursors of good life habits development in children [30]; accordingly, it is necessary to increase the involvement of educators in nutrition education and active lifestyle promotion, and to enhance educators-parents relation as a way of improving this promotion [31]. Knowledge (K) is crucial for nurseries' educators but also practices (P) and the professional values (V) to continuously learn and eagerly shape children nutrition behaviors; this come in line with KVP model developed for educators by Clement [32]. Practices in early childhood should be adapted according to development and individual child (33); this comes in line with NAYEC's Developmentally Appropriate Practice (DAP).

In fact, DAP is a key model of practice in early childhood education. Its main objective is to foster early childhood education excellence. However, educator's learning remains one of the most important factors influencing their beliefs or values (V) and practices (P) [34; 35]. Children are more prone to learn unhealthful eating behaviors when adults use food as an incentive, pacifier or punishment [19]. Many recent reviews suggested that, to encourage and motivate children, offering verbal instead of concrete rewards, small instead of big rewards, and rewards for the quality of their performance and not for the quantity of behavior, was found out to be more successful to ameliorate children behavior especially for fruit and vegetables intake [36]. Children should be encouraged to taste new foods, and occasionally praised when they eat a variety of food. Practically, most of children are rewarded with sweets and candies. This habit lets the child believe that sweets are better than other foods [19]. Because no single food contains all the required nutrients for the body; nurseries' educators should help to serve children a variety of available fruits, colorful vegetables, lean protein and whole grains [19]. The written nutrition plan should be appropriate and sometimes individualized particularly for children who require dietary modification based on food intolerance (gluten or lactose intolerance) or on cultural preferences (i.e. vegetarian). As an act of prevention, the high density and hyper-caloric food such as sweetened drink and beverages should not be included in the plan. Talking and describing the food positively can make the children more curious and interested and stimulate their desire to taste [37].

Child cares use assessments in early childhood to support children's learning, using screening to recognize possible problems in development and to confirm that development is on target, instructional assessment to inform and support

learning, diagnostic to detect strengths and areas of need to support development and behavior and program evaluation for the purpose of program improvement [38]. Once a nutritional risk indicator is recognized through screening, a nutrition assessment, based on anthropometric indices is needed to determine an infant's nutritional needs, to identify growth complications in individual children and develop a nutrition care plan [39].

In Lebanon, a study conducted in 57 Metn Nurseries found that nearly half of nurseries educator, from any educational background, lacked essential knowledge of nutrition and health pertaining to infants. The analysis of preset menu revealed a general lack of nutrients by 73%. 60.4% of educators showed their interest about acquiring nutrition knowledge [40]. Metn nurseries represents 25% of nurseries in Lebanon [41] and their nursery educators clearly lack essential nutrition knowledge precursor of good life habits development in children.

Our study proposes to evaluate and address the nurseries educators' deficit in nutritional knowledge in selected nurseries and to assess if this impacts children nutritional status. Thus to answer the following questions: Will nutrition education sessions to nurseries' educators, and or related activities implemented with children positively impact the knowledge, practices and may be the values of educators? Will these activities ultimately and positively influence children nutrition status?

### 3. Methodology

To reach the objective, 4 licensed nurseries were selected in Mount Lebanon and in Beirut to do in each a multi-component intervention. This multi-component intervention consisted of a nutrition education course and several activities over a period of 6 months.

These nurseries were labeled as such: N1, a public nursery and N2, a private nursery both are located in Beirut, N3 and N4, private nurseries and both are located in Mount Lebanon. The selected nurseries were located in Beirut and Mount Lebanon, which have the highest concentrations of nurseries in Lebanon. Private nurseries represent more than 90% of all nurseries in Lebanon [41]; thus 1 selected nursery was public and 3 were private.

The study design included a pre-intervention phase in which 2 questionnaires were filled by educators and nurseries' directors in addition to anthropometric evaluation of the children present at the nurseries. The intervention phase included several activities such as a nutrition course over several sessions, activities to be implemented with children and a parent session; these activities were not all conducted in every selected nursery.

The study enrolled 184 children and 30 nurseries' educators at baseline, and 103 children and 25 nurseries' educators post-intervention. The table hereafter summarizes the number of children tested, their age and sex and the number of nurseries' educators at baseline and post-intervention

**Table 1:** Number of Children Tested, their Age and Sex and Number of Nurseries' Educators at Baseline and Post-Intervention

	N1		N2		N3		N4	
	Baseline (B)	Participating Children Post-Interventions (PI)	B	PI	B	PI	B	PI
Total # of Children (% Compared to baseline)	25	6 (24%)	59	25 (42%)	53	25 (47%)	47	47 (100%)
Average Age in months	30	25	28	26	28	31	26	30
Girls # (%)	9 (36%)	3 (50%)	34 (47%)	12 (48%)	30 (57%)	14 (56%)	26 (55%)	26 (55%)
Average Age in months	31	25	28	27	28	31	26	30
Boys # (%)	16 (64%)	3 (50%)	25 (42%)	13 (52%)	23 (43%)	11 (44%)	21 (45%)	21 (45%)
Average Age (months)	26	30	26	28	28	31	26	30
Total # of Nurseries' Educators	3	2	6	6	9	6	12	11

A baseline test–post intervention test design was chosen. The data, using questionnaires in addition to the children anthropometric evaluation were collected in all nurseries at the beginning (baseline data) of the study and after the interventions (post-intervention data). 2 questionnaires: A and B were used and filled at baseline and after intervention. Questionnaire A was based on the questionnaire written by the Extenso team of the Department of Nutrition at the University of Montréal, addressed specifically to nurseries' educators in Quebec. Minor modifications were brought to this questionnaire by replacing Canadian cultural specific food with equivalent Lebanese ones for better evaluation. Basic nutrition background and behavior – in terms of knowledge, value and practice were scored and descriptively analyzed at baseline and post intervention. Questionnaire B was self-developed and intended to nursery directors to collect general information about the nurseries. It includes twenty-five questions aiming to collect socio-demographic data of the nursery and offered food menu characteristics.

For the anthropometric measurements, 2-trained operator conducted it according to the standard method described earlier. Measurements with discrepancies more than 5% were repeated. Measurements with no discrepancies were recorded, their average calculated and used in results and analysis. The measures used as indices of growth and development included stature and weight. The measurements were plotted on the appropriate growth chart chosen according to toddlers' gender and age. The criteria used to analyze data were: Length-for-Age, Weight-for-Age, Length-for-Weight and BMI-for-Age.

Nutrition education course sessions for educators and parents' sessions were founded on KVP and NAYEC-DAP. It was developed using several books, guidelines and publications mainly the American Nutrition Academy, Center of Disease Control and Prevention, the National Association for Sports and Physical Education (NASPE), the U.S. Department of Health and Human Service, the American Academy of Pediatrics and the American Academy of Dermatology, Krause's Food and the Nutrition care process and others.

Nutrition Activities proposed to educators included 11 exercises and 15 games as well as 41 ready-to-use ideas, action alternatives and lessons. The objective was to introduce nutrition related topics to children in a developmentally appropriate way. In addition to KVP and NAYEC-DAP, many guidelines and publications were used as the foundation for these activities especially the United States Department of Agriculture [42], the Food and Nutrition Services [43], and the department of Health and Human Services [44]. The following table summarizes the activities implemented with children in the nurseries:

**Table 2:** Summary of Nutrition Activities implemented with children in the Nurseries

Visit	Nutrition Activities	
	Duration	Theme
Visit 1	2 weeks	“Good Start, Grow Smart” 5 Food Groups
Visit 2	2 weeks	“Let's Eat a Rainbow” Fruits and Vegetables
Visit 3	2 weeks	“Mighty My Plate” My Plate

The content validity of these activities was determined by 2 expert researchers in nutrition (one) and education (one) a nursery director (one) and a nursery educator. For reliability purposes, a pilot test for the first version of the sessions and activities was done in one nursery in Bail with 4 nursery educators that were not part of this study. The session were videotaped and analyzed after. Educators were also asked to give their own feedback on the sessions and activities. Based on the feedback and findings of the pilot test, a final modified version of the sessions and activities was constructed.

The implementation of the interventions was undertaken after the completion of baseline data collection in all nurseries. The time lapse was between February 2017 and July 2017 for N1, N2 and N3 while the intervention in N4 was conducted between October 2017 and February 2018. The same activity plans and materials were used in each of the four nurseries. The following table summarizes the type of intervention in each nursery:

**Table 3:** Summary of Intervention Types in Selected Nurseries

N1	N2	N3	N4
Nutrition Education course sessions for nurseries educators	Nutrition Education course sessions for nurseries educators	Nutrition Education course sessions for nurseries educators	Nutrition Education course sessions for nurseries educators
Anthropometric	Anthropometric	Anthropometric	Anthropometric Measurements

Measurements for Children pre and post intervention	Measurements for Children pre and post intervention	Measurements for Children pre and post intervention	for Children pre and post intervention
Implementation of the activities for children	Activities for children NOT Implemented	Implementation of the activities for children	Implementation of the activities for children
Basic nutrition, and practical Tips session for Parents conducted	Basic nutrition and practical Tips session for Parents NOT conducted	Basic nutrition and practical Tips session for Parents NOT conducted	Basic nutrition and practical Tips session for Parents conducted

The following figure summarizes the steps followed in the study protocol:



Figure 1: Study Flow Chart

#### 4. Results and Discussion

Most of the educators (>75%) in the nurseries are university graduates mainly in Mount Lebanon, the remaining mostly technical school. The monthly subscription is different for each of the nurseries thus covering a broad range of economical status. The table here below summarizes the educators' educational level in interventional nurseries per area:

Table 4: Nursery's Educators' Education Level in all Interventional Nurseries

Educators' Educational Level	Nurseries			
	N1	N2	N3	N4
School Level				1
University Level	1	6	4	8
Technical School	1		2	2

Table 5: Percent of Children Height-for-Age Analysis at Baseline and Post-Interventions

	N1		N2		N3		N4	
	Baseline	Post-Interventions (PI)	Baseline	PI	Baseline	PI	Baseline	PI
Stunting			5	4	6	8	17	9
Below the Mean	24		3	20	4		2	36
Healthy Range	56	84	65	56	64	64	68	45
Above the Mean	16	16	24	20	26	20	11	6
Tall	4		3			8	2	4

#### BMI for Age Analysis

BMI-for-age is an anthropometric index of weight and height combined with age. It is used to classify children as underweight, overweight, or at risk of overweight. The table here below details the percent of children Weight for BMI and Age analysis at baseline and post-interventions. It is quite clear that the percentage of children in healthy weight

#### Descriptive Analysis of Nutrition Parameters in Nurseries at Baseline and Post-Interventions

##### Height for Age Analysis

Height-for-age tool describes linear growth relative to age and it is used to define shortness or tallness and as classified by Shaw et al., it is the best overall indicator of nutritional wellbeing [45]. The table here below details the percent of children Height for Age analysis at baseline and post-interventions. It is quite clear that most of children were in healthy range before and after the interventions. Stunting in this case seems in not related to socio economic factors since N4 is on the highest range of monthly subscription and N1 on the lowest in Lebanon. The table here below summarizes the percent of children Height-for-Age analysis at baseline and post-Interventions.

increased, overweight and obese decreased in all nurseries except in N4 where nutrition sessions were not conducted. Underweight children in N3 decreased from 8% to 4 % whereas remained the same in N4; these results could be indicative but not significant. The table here below summarizes the percent of children BMI-for-Age analysis at baseline and post-interventions in each nursery.

**Table 6:** Percent of Children BMI-for-Age Analysis at Baseline and Post-Interventions in each Nursery

	N1		N2		N3		N4	
	Baseline	Post-Interventions	Baseline	PI	Baseline	PI	Baseline	PI
Underweight					8	4	2	2
Healthy Weight	56	100	59	67	55	68	66	51
Overweight	28		20	19	23	20	19	17
Obese	16		20	14	15	8	13	30

If all nurseries data pertaining to BMI for Age analysis were combined it is quite clear that more children became in the healthy weight range Post-Interventions as shown in the table below:

**Table 7:** Percent of Children BMI-for-Age at Baseline and Post-Interventions in all Nurseries

	All Nurseries	
	BMI Baseline	BMI Post-Interventions
Underweight	3	3
Healthy Weight	59	67
Overweight	22	16
Obese	16	14

Therefore, the weight-for-height and BMI-for-age results in the 4 nurseries highlight yet the need for intervention.

**Descriptive Analysis of Nursery Educators’ Answers at Baseline and Post- Interventions**

The answers pertaining to nutrition education of all educators combined at baseline and post intervention were taken into consideration to have noteworthy values. Only notable differences in answers were retained. Upon descriptively analyzing the answers it is worthwhile to mention that:

- 40% (Baseline: 44%, Post-Interventions 84%) are more willing to accept parents’ guidance in regards to children food aversion and are prepared to discuss feeding strategy also.
- 32% of educators are willing more to help children try new food (Baseline: 36%, Post-Interventions 68%)
- 28% are more convinced they have an essential role in nutritionally educating children.
- 28 % are more persuaded that children may like fruit (Baseline: 44%, Post-Interventions 72%).

**Statistical Analysis of Knowledge, Practice and Value Scores at Baseline and Post-Interventions**

Significantly higher means knowledge score at baseline and post-interventions were found in educators who did the nutrition education sessions compared to those who did not.

Furthermore, significantly higher means knowledge score baseline and post-interventions were found in those who implemented the activities for children and attended the parents’ session compared to those who did not. Thus knowledge increased even if the educator has only implemented the activities or attended the parents’ session but not enough to show significant change in nutrition parameters in children

A significantly higher mean value score was found post-intervention in those who did undergo parents’ session compared to those who did not (23.30 vs. 22.33; p=0.019); furthermore and as shown before, educators are more willing to cooperate with parents for the best nutrition outcome for children and they feel more responsible to shape children’s behavior post interventions.

A significantly higher mean knowledge score at baseline was found in those who worked in private compared to public nurseries (124.25 vs. 92.22); this is quite normal since most of educators in private nurseries are university graduates and the sample size in public nursery is small to determine. It is worthwhile mentioning that some universities in Lebanon delivering and education diploma include in their curricula a nutrition course; this could partially explain these results. No significant difference was found between all nurseries in terms of value and practice scores.

The post hoc analysis between the knowledge score post-interventions and the nurseries showed that a lower knowledge score post-interventions was seen in nursery 4 compared to nursery 1 (66.20 vs. 106.25; p=0.051), nursery 2 (66.20 vs. 109.88; p<0.001) and nursery 3 (66.20 vs. 108.37; p=0.001); this might be due to the fact that the nutrition education sessions were not conducted in Nursery 4.

The table here below contains bivariate analysis of factors associated with knowledge, value and practice scores at baseline and post-interventions:

**Table 8:** Bivariate Analysis of Factors Associated with the Knowledge, Values and Practices Scores at Baseline and Post-Interventions

Variable	Knowledge score Baseline	Knowledge score Post-Interventions (PI)	Value score Baseline	Value score PI	Practice score Baseline	Practice score PI
Nutrition Education Course Sessions						
No	66.20 ± 20.69	69.36 ± 4.51	23.45 ± 1.21	23.27 ± 1.01	101.97 ± 59.70	88.68 ± 42.80
Yes	108.71 ± 14.01	114.75 ± 11.09	22.64 ± 1.01	22.50 ± 1.02	110.66 ± 21.62	106.20 ± 43.85
p-value	<0.001	<0.001	0.081	0.071	0.618	0.327
Activities implementation						
No	82.85 ± 27.87	89.82 ± 25.60	22.33 ± 1.36	22.17 ± 0.75	105.13 ± 21.73	92.34 ± 46.89
Yes	109.88 ± 12.72	110.50 ± 12.22	23.21 ± 1.03	23.05 ± 1.08	107.38 ± 47.02	117.96 ± 22.96

p-value	0.032	0.015	0.106	0.076	0.911	0.089
Parents session						
No	71.92 ± 23.95	77.81 ± 21.10	22.67 ± 1.07	22.33 ± 0.98	100.73 ± 54.88	92.81 ± 40.41
Yes	109.12 ± 15.19	113.17 ± 11.07	23.31 ± 1.18	23.30 ± 0.95	113.46 ± 21.39	104.65 ± 21.39
p-value	<0.001	<0.001	0.170	0.019	0.460	0.507
Nursery						
1	106.25 ± 0.00	124.25 ± 6.36	22.50 ± 0.71	23.50 ± 0.71	93.88 ± 19.62	115.50 ± 7.78
2	109.88 ± 12.72	110.50 ± 12.21	22.33 ± 1.36	22.17 ± 0.75	105.13 ± 21.73	117.96 ± 22.96
3	108.37 ± 18.55	115.83 ± 10.18	23.00 ± 0.63	22.50 ± 1.22	121.79 ± 19.19	91.33 ± 63.19
4	66.20.69	69.36 ± 4.51	23.45 ± 1.21	23.27 ± 1.01	101.98 ± 59.70	88.68 ± 42.80
p-value	<0.001	<0.001	0.261	0.129	0.796	0.551
Nursery type						
Private	106.25 ± 0.00	124.25 ± 6.36	22.50 ± 0.71	23.50 ± 0.71	93.88 ± 19.62	115.50 ± 7.78
Public	87.66 ± 28.21	92.22 ± 23.90	23.04 ± 1.19	22.78 ± 1.09	107.97 ± 43.40	97.01 ± 44.98
p-value	0.369	0.006	0.535	0.373	0.658	0.574

**Bivariate Analysis of Factors Associated with BMI in Children**

A significantly higher percentage of children had an improved BMI in educators who attended the nutrition education sessions compared to those who did not (58.2% vs. 38.3%; p=0.045). This result is quite encouraging since we have observed a tangible nutrition parameter i.e. the BMI improving by simply attending the session. The table here below shows the bivariate analysis of factors associated with BMI in children.

**Table 9:** Bivariate Analysis of Factors Associated with BMI in Children

Variable	No BMI improvement	BMI improvement	p-value
Nutrition Education Course Sessions			0.045
No	29 (61.7%)	18 (38.3%)	
Yes	23 (41.8%)	32 (58.2%)	
Activities implementation			0.913
No	12 (50.0%)	12 (50.0%)	
Yes	40 (51.3%)	38 (48.7%)	
Parents session			0.327
No	22 (45.8%)	26 (54.2%)	
Yes	30 (55.6%)	24 (44.4%)	
Knowledge score Baseline	89.28 ± 26.19	98.44 ± 23.63	0.372
Value score Baseline	23.50 ± 1.27	22.67 ± 0.98	0.076
Practice score Baseline	126.35 ± 45.70	93.83 ± 34.89	0.055
Knowledge score Post-Interventions	80.23 ± 33.65	95.58 ± 20.90	0.164
Value score Post-Interventions	23.00 ± 1.41	22.73 ± 0.80	0.552
Practice score Post-Interventions	93.65 ± 53.44	101.72 ± 36.94	0.659

**Multivariate Analysis**

The results of a first linear regression, taking the knowledge score as the dependent variable, showed that undergoing nutrition education sessions (Beta=45.39) was significantly associated with higher knowledge scores compared to those who did not undergo this intervention. The table here below highlights the multivariate analysis:

**Table 10:** Multivariate Analysis taking the Knowledge Score as the Dependent Variable and associating with Nutrition Education Course

Linear regression taking the knowledge score as the dependent variable				
Variable	Unstandardized Beta	Standardized Beta	p-value	95% Confidence Interval
Nutrition Education Course Sessions (yes vs. no)	45.39	0.936	<0.001	38.004-52.767

**5. Discussion**

Overall, the objective of the study was achieved. In fact this study showed that nutrition course sessions improved nurseries' educators nutrition knowledge and this positively impacted children's BMI. In fact educator knowledge in theory is related to classroom teaching or practices and subsequent child outcome [33; 46; 47]. "Knowledge" is essential for teaching since educators will use it to develop instructional choices in their classroom [48; 49]. Knowledge related to practices has been well researched [47; 50; 51; 52]. Similarly, early childhood researchers have observed several type of educators' knowledge, including knowledge that educators use in practice [53].

Values or believes of educators may impact their practices in the classroom according to researchers [54]. Taking the original DAP guidelines, Charlesworth et al., (1991) stated developmentally appropriate beliefs or values and self-reported practices were reasonably correlated [55]. A clear interrelation of educators' knowledge, practice and professional values in early childhood education; although this relation is sometimes not well defined or presented however it exists.

In this study, nutrition education course was significantly associated with higher knowledge scores by the educators; In previous studies taking BMI into account, Hoffmann et al., (2014) found a positive correlation between educators' weight status and children's chance to be overweight (OR: 1.97; 95% CI: 1.01, 3.83; p = 0.047) [56]. Negative correlation between educators' usual physical activity score was correlated with children's chance of overweight (OR: 2.32; 95% CI: 1.10, 4.92; p = 0.028). No correlation was found between nutrition policies and children's BMI

categories. (56). Soderstrom, M., (2013) demonstrated no correlation between BMI and the time spent outdoors or its environment quality [57]. Outdoor playtime was significantly correlated with a BMI decrease ( $\beta = -0.05$ , 95% CI:  $-0.09, -0.01$ ;  $p \leq 0.05$ ). No correlation was demonstrated between the caretaker per child number and weight change; thus, the importance of the study result and the significant correlation between nurseries educators' knowledge and children BMI.

Findings of the present research contribute to the growing body of evidence suggesting that short interventions (4-6 months) have positive effects on the classic knowledge-attitude-behavior model [58]. Studies suggest that multicomponent nutrition education programs have greater effects on nutrition knowledge in kids [59].

## 6. Future Scope

This study opens several research directions. The methodology used enabled the study of activities and their impact on nutrition status. It would also certainly be interesting to extend this study by monitoring educators in nurseries on how they implement knowledge in developmentally appropriate practices. This study has also an important implication on nurseries educator professional development, their preparation and training and on curriculum development. Future Nursery Educators should be trained to assess children, to master knowledge in the subject matter, to propose well-adapted activities, to individually and collectively implement them in a quest to shape children's future and behavior. They should also be encouraged to do collective and collaborative work and to elaborate their own resources (activities, tools...) that can be shared, discussed and implemented in classes. These recourses could be founded on the KVP model for analysis and implementation according to their values and conception [60]. Future researches can study nurseries educators' professional development in nutrition education or promotion and identify the competencies needed for educators to be proficient. It would also certainly be interesting to extend this study by monitoring educators in nurseries on how they implement knowledge and values in practices.

## 7. Conclusion

The major finding of this study is the direct significant positive correlation between children's BMI and nurseries' educators' nutrition knowledge. A significant improve of children's BMI was observed post nutrition education course when given to educators. KVP model when adapted to nurseries' Educators through NAYEC - DAP could lay a good foundation to integrate new practices, elaborate new activities, enhance professional knowledge and improve university or institution related field curriculum. It may the foundation to develop core competencies for nurseries' educators.

### Ethics approval and consent to participate

In each nursery, study design and protocol were presented to the institution director and formal approved was ensured. Also, a signed consent form from children's parent was

guaranteed to include them in the study. The original copy was kept in our possession with a photocopy in the nurseries' record.

**Consent for publications:** not applicable

**Availability of data and material:** data sets generated and analyzed during the current study are not publically available due to confidentiality of the nurseries information.

**Conflicts of interest:** the authors declare no conflicts of interest.

**Funding:** not applicable

**Acknowledgements:** not applicable

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