Original Article

A case study on dual forms of malnutrition among selected households in District 1, Tondo, Manila

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The co-existence of under-and overnutrition in developing countries might be the resultant factor of a marked shift in dietary and lifestyle practices of people, especially in urban areas. The eating of high fat, high caloric diets, the presence of inactive entertainment devices and mechanized labour influence patterns of food demand and physical activity. This study identified factors associated with the occurrence of under/overweight or normal/normal nutritional status of child-mother pairs in one household. This study was conducted in two phases. The first phase was a survey of 376 child-mother pairs. The children aged 33-83 months were attending classes in government day care centres. Anthropometric indices: weight-for-age Z score (WAZ) $\leq$ -2SD was used to classify underweight in children. WAZ+1 to -1SD was used to indicate normal nutritional status in children, specifically for this study, in order to establish a more homogenous group. Body mass index (BMI) $\geq$ 25 kg/m^2 was used to measure overweight among mothers. Results showed that about 59% of the child-mother pairs were suffering from two different types of malnutrition. From this, 31 (8.2%) child-mother pairs in the same household were experiencing underweight/overweight: the child was underweight and the mother was overweight. The second phase of the study was an in-depth study of these 31 under/overweight child-mother pairs and 30 randomly selected normal/normal pairs. Pre-tested questionnaires were used to gather socio-economic-demographic data; 3 day 24-h food recall for dietary intake and 24-h activity recall for physical activity. Results showed that the different factors associated with the existence of underweight child/overweight mother (UC/OM) or normal child/normal mother (NC/NM) in this study were: mother's educational level, mother's occupation, and number of children in the household; energy intake, the preference of meats, sweets and sugars among children or meats and fried foods among mothers; and mother's perception on body size. Physical activity of both mothers and children was higher in the UC/OM than in the NC/NM group. The problem of undernutrition and overnutrition in one household poses enormous challenges. Although this study cannot make an inference to the whole population, the results indicate that there is a need to consider whether public health programs should focus on healthy diet and lifestyle patterns that will lead to optimal health outcomes at both ends of the spectrum of nutritional status.

Key Words: dual malnutrition, underweight child/overweight mother, Philippines

Introduction

Undernutrition remains as the nutrition problem of greatest concern in developing countries. However, there is now greater awareness that dietary patterns and lifestyles are changing dramatically, and that as a result, obesity is becoming a problem.[1] The Food and Nutrition Research Institute, Department of Science and Technology, National Nutrition Survey (1998) reported that 3.8% child-caregiver pairs were suffering from undernutrition or overnutrition. Specifically, under/over nutrition prevalence in Metro Manila was 4.6%.[2]

In general, problems of under and overnutrition often coexist because of the marked shift in the structure of the diet in which an increasing proportion of people consume high fat, high caloric diets which are associated with a number of chronic diseases.[3] The possibility that underweight and overweight coexist within households has not been extensively studied. From the nutrition point of view, the reasons are: 1. underweight and overweight result from energy deficit and excess, respectively, and are thought to be associated with very different environmental, behavioural behavioural and individual risk factors; 2. the two conditions are underlying contributors to two distinct types of public health concerns.[4] Overweight is a predisposing factor to chronic and degenerative diseases like diabetes, hypertension and cardiovascular diseases, whereas underweight has been associated with low bone mass, and all-cause mortality.[5] However, the two conditions may not be opposite expressions of distinct behaviours and environmental conditions. If underweight and overweight can occur in the same household, common underlying causes of both conditions may exist[4].

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This study had identified factors associated with the occurrence of underweight/overweight or normal/normal nutritional status of child-mother pairs in selected households in District I, Tondo, Metro Manila.

Methods

This study had a descriptive analytical design, employing a purposive sampling technique, conducted in District I, Tondo, Metro Manila. Metro Manila was chosen as the study site on the basis of easy accessibility. District I of Tondo is an urban poor community with a total estimated population of 348, 324 with 136 barangays (villages). Houses in these barangays are built close or in row type structures. Most of them are small so the rooms tend to be multipurpose – the dining room for example may also be a bedroom and/or receiving room. Space outside the house for outdoor activities is also minimal. Most of the houses have sanitary toilets, but no proper septic tanks. Waste flows directly into the open drains.

Prior to the implementation of this research, proper administrative and community coordination at all levels was conducted. There are 67 operating government Day Care Centres with 3430 enrolled preschool children in the area. Day Care Centres were chosen to get a captive group of 33 to 83 month old children.

The study was conducted in two phases: the first phase was a cross sectional study. The subjects were taken from 14 most populated Day Care Centres located in 14 Barangays, as suggested by the City Social Development Officer. The subjects were children aged 33 to 83 months who were having classes in the morning (*N*=576). They were advised by their teachers to bring their mother on a specific measurement day. However, a total of only 376 child-mother pairs came for anthropometric assessment. The research protocol was briefly discussed with all mothers.

Weight of children and mothers was measured and recorded to the nearest 0.1 kg using a Detecto weighing scale (Webb City, Mo. U.S.A). Subjects wore lightweight clothing and no shoes. Height was measured and recorded to the nearest 0.1cm using a microtoise (Depose, France) posted flat against a wall.[6] Anthropometric Z-scores were computed for all children (*N*=376) relative to the WHO/NCHS reference population[7,8] using the Fox pro Software Package (1989).

The second phase was an in-depth study on selected subjects identified from the cross-sectional study. In this study, the cut-off for weight-for-age Z score (WAZ) +1 to –1SD was used to define children with normal nutritional status. This was agreed upon by the participating researchers in other countries to establish a more homogenous group. WAZ≤-2SD was used to define underweight. Body Mass Index (BMI computed as weight in kg/height in metre^2) cut-offs used to define overweight was BMI ≥ 25 kg/m^2 and BMI ≤ 18.5 kg/m^2 for underweight or chronic deficiency among adults aged ≥18y.[6] The two types of nutritional status combinations considered in this study were: (1) underweight/ verweight pair was classified as such if the child was underweight (WAZ ≤ -2 SD) and the mother was overweight (BMI≥25 kg/m^2); (2) normal/ normal pair if the weight of the child BMI=18.6 to 24.9 kg/m^2. The required number of subjects was normal (WAZ +1 to –1SD) and BMI of mothers was for each group was 30 child-mother pairs. Since there were only 31 child-mother pairs identified as underweight/overweight from the cross-sectional survey, all were taken as subjects. The 30 normal/normal child-mother pairs were selected randomly from the sampling list.

Pre-tested structured questionnaires were developed to collect the variables of interest for both mother and child pairs: socio-economic-demographic data, food intake, food behaviour, perception of mothers on body size, and physical activity. All information on the children was recorded as reported by the mothers. Food intake was gathered using a 3-day repeated 24-h recall encompassing 2 weekdays and one weekend.[9,10]. The data was converted to nutrient intakes using the Food and Nutrition Research Institute, Department of Science and Technology (1997) Individual Dietary Evaluation System. Nutritional adequacy of intake was assessed by comparing nutrient intakes to 100% of the Recommended Dietary Allowances for Filipinos.[11]

The information on food behaviour that required multiple answers included questions on food preferences and foods avoided by both child-mother pairs with their corresponding reasons. Mother's perception on body size was aided by showing a drawing labeled with the different body size categories reflecting the images of very thin (VT), thin (T), somewhat thin (ST), just right (JR), fat, (F), somewhat fat (SF), and very fat (VF).

Physical activity for both child - mother pairs were recorded using a 24-h activity recall. Mothers were asked to enumerate their activities a day prior to the interviewer's visit with corresponding time spent in each activity. Child's physical activity was collected as reported by the mothers. A validation of physical activity was conducted by asking the children whether they did the different activities - activities were randomly selected by the interviewers from the recorded activities. The BMR was computed using the Schofield's Equation and total energy expenditure was expressed in terms of the BMR multiplied by a metabolic constant.[12,13]

Descriptive statistics were generated for all variables. A chi-square test was used to determine associations between two proportional variables, including percentage adequacy of food intake, while student t-test was employed to determine significant differences in dietary intake and physical activity between the two groups.[14,15] Data were analyzed with a *Statistical Package for Social Sciences (version 9, 1999)*, SPSS Chicago. Significance was set at $P< 0.05$.

Results

Profile of subjects

The total number of child-mother pairs who were assessed for weight and height in the survey and mean values for selected variables are presented in Table 1. Mean age of children was 65.8 months with a mean weight of 16.1 kgs, and mean height of 104.6 cm. Mothers mean age was 35.4 yrs, mean weight was 52.8kg,

Table 1. Profile of child - mother pairs

Variables	Mean ± SD *N* = 376	Range *N* =376
Children		
Age (months)	65.8 ± 12.2	33.7 - 82.9
Weight (kg)	16.1 ± 2.8	7.5 - 32.6
Height (cm)	104.6 ± 7.3)	75.9 - 120.0
Mothers		
Age (y)	35.4 ± 9.7	22.3 - 46.2
Weight (kg)	52.8 ± 10.0)	32.0 - 88.3
Height (cm)	150.4 ± 5.0	137.5 - 168.1
BMI	23.3 ± 4.1	14.8 - 39.9

while mean height was 150.4 cm, with a mean BMI of 23.3 kg/m^2 (range 14.8 – 39.9 kg/m^2). Figure I presents the different forms of nutritional status combinations of child-mother pairs: normal child/normal mother (NC/NM) 41%; normal child/overweight mother (NC/OM) 20.7%, underweight child/normal mother (UC/NM) 20.5%; underweight child/overweight mother (UC/OM) 8.2%; normal child/underweight mother (NC/UM) 4.5%; underweight child/underweight mother (UC/UM) 4.3%; overweight child with normal mother (OC/NM) 0.5% and overweight child with overweight mother (OC/OM) 0.3%.

Table 2 presents the profile of selected child-mother pairs included in the in-depth interview. There were no significant differences in mean age, weight, and height of children between the two types of nutritional status combinations. Likewise, the mean age of mothers in the UC/OM and NC/NM groups were similar.

Socio-economic-demographic data

The mother's educational level, mother's occupation and number of children in the family showed significant association with nutritional status (P<0.05). The mean monthly family income ($130 for UC/OM vs. $125 for NC/NC) and mean daily food expenditure ($3 on both groups) did not show any association with nutritional status. Furthermore, households with or without sanitary toilets, type of dwelling (either in a makeshift or apartment) or presence of amenities in the households (TV, electric, radio refrigerator, etc) were also not associated with nutritional status (Table 3).

Table 2. Profile of selected child-mother pairs

Variables	Group UC/OM *N* =31	Group NC/NM *N* =30
Children		
Age (mo)	63.5 (±10.9)	58.8 (±12.1)
Weight (kg)	13.7 (±1.4)	17.7 (±1.9)
Height (cm)	99.9 (±6.6)	106.6 (±5.9)
Mothers		
Age (y)	34.2 (±9.5)	32.2 (±5.1)
BMI	28.9 (±3.2)	22.1 (±1.5)

Table 3. Socio-economic profile of selected child-mother pairs

Variables	Group UC/OM (*N*=31)		Group NC/NM (*N*=30)	
	N	%	*N*	%
Mother's education level[1]				
Elementary	9	29.0	3	6.7
High School	20	65.5	18	66.7
College	2	6.5	9	26.6
Mother's occupation[1]				
Housekeeper	17	54.8	23	76.7
Vendors	10	32.3	6	23.3
Others	4	12.9	1	0
Mean number of children[1]	4		3	
Mean family income ($)	129.73		125.3	
Mean daily food expenditure ($)	2.93		3.04	
Households with unsanitary toilets	4	12.9	30	100
Type of dwelling				
Makeshift (barong/barong)	11	35.5	9	30.0
Apartment	20	64.5	21	70.0
Households with:				
Television	27	87	25	83
Radio	14	45	16	53
Electric fan	30	97	30	100
Refrigerator	10	32	15	50

[1]$P < 0.05$

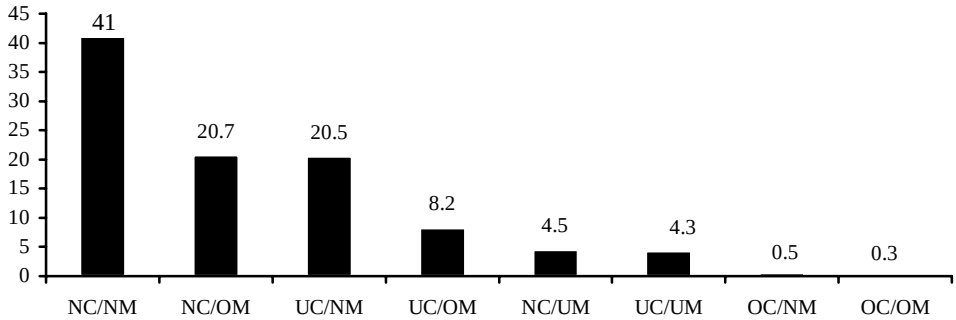

Figure 1. Nutritional status combinations of child – mother pairs

Dietary intake

Children in the UC/OM group had a mean energy intake of 1058kcal. This was significantly lower than the NC/NM group (1312 kcal). Intakes of protein, fat, carbohydrate and calcium were also significantly lower in the UC/OM group than in the N/N group. Percent adequacy of nutrients revealed that only protein (104%) and vitamin A (145%) were above the RDA in the UC/OM group, while protein (146 %), iron (101%), and vitamin A (120 %) were above the Recommended Dietary Allowances (RDA)[11] in the NC/NM group. An adequate intake of nutrients assessed in this study were not significantly associated with nutritional status of children (Table 4).

Among mothers, vitamin A intake of both UC/OM (869μgRE) and NC/NM (790μg RE) groups were similar. However, mothers in the NC/NM group had significantly higher intake of energy (2128kcal) and all other nutrients than the UC/OM group (P<0.05). The same trend can be observed in nutrient adequacy between groups. However, intake of iron and ascorbic acid, although higher in the NC/NM group than the UC/OM group, the percentage adequacies of these nutrients fell short of the RDA. An adequate intake of nutrients assessed in this study were not significantly associated with nutritional status of mothers (Table 5).

Table 4. Mean one-day per capita energy and nutrient intakes and percent reaching 100% of the Recommended Dietary Allowances among children

Variables	Group UC/OM (N =31)		Group NC/NM (N =30)	
	Mean	%	Mean	%
Energy (kcal)[1]	1058	67	1312	85
Protein (g)[1]	32.9	104	44.8	146
Fats (g)[1]	25		32	
Carbohydrates (g)[1]	174		208	
Calcium(g)[1]	0.33	55	0.51	84
Iron (mg)	7.9	80	10.1	101
Vitamin A (mg/RE)	541	145	443	120
Ascorbic Acid (mg)	35	78	32	77

[1] P <0.05 significantly different between groups

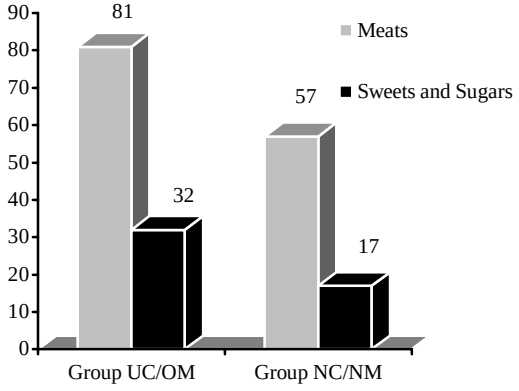

Figure 2. Food preferences of children

Table 5. Mean one-day per capita energy and nutrient intakes and percent reaching 100% of the Recommended Dietary Allowances, among mothers

Variables	Group UC/OM (N=31)		Group NC/NM (N=30)	
	Mean	%	Mean	%
Energy (kcal)[1]	1434	77	2128	112
Protein (g)[1]	48.7	94	75.1	144
Fats (g)[1]	22		50	
Carbohydrates (g)[1]	254		337	
Calcium(g)[1]	0.30	60	0.60	120
Iron (mg)	9.8	43	15.6	59
Vitamin A (mg/RE)	869	193	790	176
Ascorbic Acid (mg)	23	33	48	69

[1] P <0.05 significantly different between groups

Food behaviours of child-mother pairs

Figure 2 shows the first two most preferred foods by children: meats (UC/OM = 80.6% vs. NC/NM = 56.7%), sweets and sugars (UC/OM = 32% vs. NC/NM = 17%). The preference for these foods was significantly associated with nutritional state (P<0.05). The three frequently stated reasons of mothers why their children preferred these foods were similar in both groups: their children like the taste, these foods are affordable, and these will make their children healthy. The foods avoided by children in both groups were vegetables. Mothers in both groups said that their children dislike the taste and have the feeling of indigestion.

Figure 3 shows the two most preferred foods by mothers: meats (UC/OM = 93.5 % vs. NC/NM = 66.7%) and fried foods (UC/OM = 64% vs. NC/NM = 40.0%). The preference for these foods was significantly associated with nutritional state (P<0.05). These reasons for preference were: they like the taste and were affordable. However, some mothers in both groups indicated that certain foods were avoided at certain times - meat and poultry, fats and oils and sweets and sugars were avoided in the presence of an illness, like hypertension. The commonly practiced home cooking method was frying (UC/OM = 45%, NC/NM = 53%) and the main reason was to make the foods more palatable (UC/OM = 58%, NC/NM = 43%).

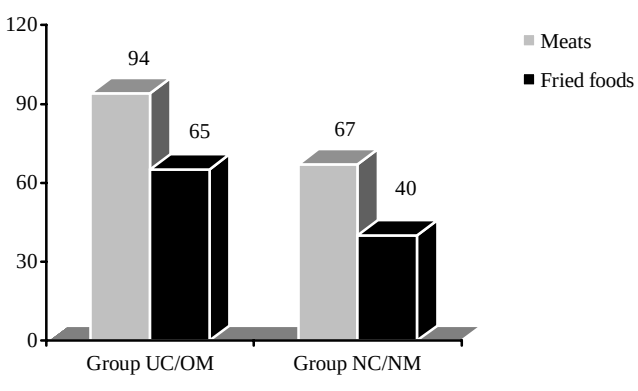

Figure 3. Food preferences of mothers

Total energy expenditure

Energy expenditure of children in the UC/OM group (1390 kcal) was significantly higher than the NC/NM group (1162 kcal) (P <0.05) (Fig. 4). Among mothers, the energy expenditure of the UC/OM group was 2072 kcal and was significantly higher than that of the NC/NM group (1736 kcal) (P <0.05) (Fig. 4). Total energy expenditure among children and mothers was significantly associated with nutritional status (P<0.05).

Mother's perception on body size

In the UC/OM group, 3% said they are somewhat thin, 35% have perceived themselves as having just the right body size, 42% as somewhat fat, 13% as fat and 7% claimed that they are fat. In the NC/NM group, 17% considered themselves as thin; 17% as somewhat thin, 50% as just right, 13% as somewhat fat, and 3% as very fat (Fig. 5). The mother's perception of her own body size was significantly related to her nutritional status (P<0.05). Mothers in the UC/OM group said that their children were: very thin (32 %), thin (26 %), somewhat thin (29 %), and just right (13 %). In the NC/NM group, 30% said that their children were thin, 34% somewhat thin, 33% just right, and 3% somewhat fat (Fig.6). The mother's perception of her child's body size was significantly related to the child's nutritional status (P<0.05).

An additional question was asked to mothers about their preference of childrens' attractive body size in a baby contest. The mothers in the UC/OM group preferred children who were somewhat thin (16%); just right (45%); somewhat fat (29 %); fat (3 %); and very fat (7 %). The preference of mothers in the NC/NM group revealed that: 13% preferred their children to be thin, 3% somewhat thin, 47% just right, 27% somewhat fat; 7% fat; and 3% very fat. Their answers were significantly associated with nutritional status.

Discussion

Nowadays, the existence of any sort of dual forms of malnutrition in the same household has not been extensively studied. For the past years, underweight and overweight have been treated as two distinct public health problems, each having specific underlying factors. However, the existence of underweight and overweight among the members of a family in one household simply implies that these members might have similar exposures that could influence both types of malnutrition.

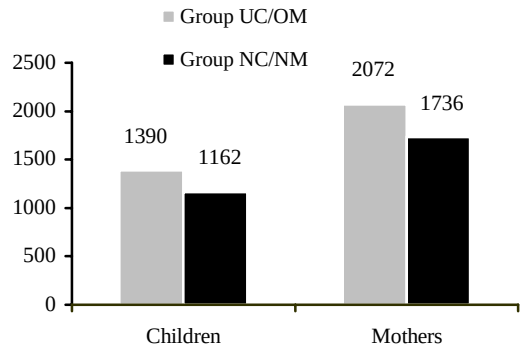

Figure 4. Mean energy expenditure of mothers and children

The results of this study, wherein about 59% of the child-mother pairs in one household were experiencing dual forms of malnutrition (Fig.1), was similar with the results obtained from Brazil, China, and Russia.[4,16,17] Evidence has shown that the occurrence of underweight/ overweight in close proximity were from developing countries like the Philippines, where rapid changes in environmental, dietary, and physical activity[2] patterns were being experienced.

The presence of under/overweight child-mother pairs (8.2%) in this study indicates that the country is facing nutritional problems at both ends of the spectrum. Since underweight and overweight co-exist in one household, it can be deduced that both child and mother have similar exposures that might have influenced the occurrence of these dual types of nutritional status. The second phase of the study tried to identify these factors. The profile of the selected subjects for the in-depth study is presented in Table 2.

Socio-economic-demographic data

The mother's educational level was significantly related to her nutritional status (Table 3). The emergence of this relationship reinforced the UNICEF Model which has illustrated that maternal and child's nutritional status depend not only on food intake but also on the mother's education, knowledge and beliefs.[18,19]

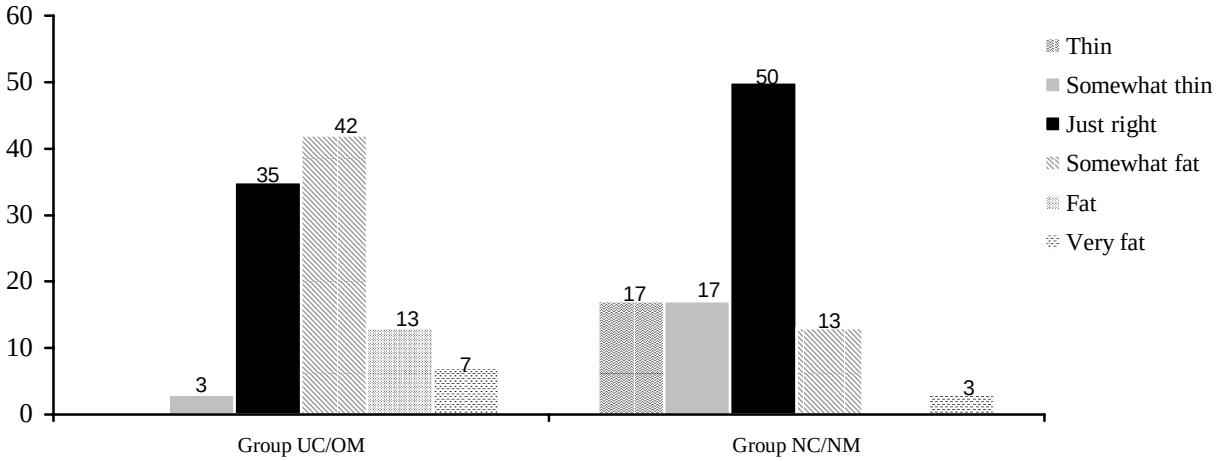

Figure 5. Mother's perception of her body size

Furthermore, a study also showed that maternal educational level has a critical role in affecting many aspects that indirectly impinge upon the child's nutritional status.[20] This is so because it is generally assumed that when mothers have some education they would be more aware of the health and dietary precautions for their children than those without education. Low maternal educational level could contribute to relatively poor knowledge of health-giving food practices for children and themselves. Since mothers are the primary caregivers responsible for managing food intake at home, the practices they employ would have a significant effect on the household members' health and nutritional status.

The association of mother's occupation and work burdens with nutritional status could be attributed to their lack of quality time for themselves and for their family. Lack of time could hamper proper menu planning, selection, preparation of foods and effective child rearing practices (e.g. feeding practices). Several studies have also shown that the nutritional status of children whose mothers worked outside the home was poorer than that of children of non-working women.[21]

The number of children in the family is another factor that showed association with nutritional status. This result agrees with the findings of other studies wherein larger households were significantly associated with the existence of underweight and smaller households with overweight/normal weight.[4] A large number of children in the family can lead to inadequate allocation of resources for the family in terms of foods, quality time, and finances.[19] Family income and food expenditure were not associated with nutritional status in this study while studies in China, Brazil and Russia showed no consistent pattern of asso-ciation of household type with income across the three countries. High income was associated with increased prevalence of under/over in Brazil and China, but not in Russia[3]. Studies on poverty-stricken families has shown that it generally affects the quality of food intake in children.[22] Sanitary conditions, type of dwelling unit and the presence of appliances were not associated with nutritional status. The lack of association between these variables may signify that there might be other several variables intervening between these two factors and the processes in this relationship need to be identified.

Dietary intake

Children in the UC/OM group had significantly lower intakes of energy, protein, fat, carbohydrate and calcium than the NC/NM group. Percent adequacy computation of these nutrients showed that only protein (104%) and vitamin A (145%) reached the RDAs in the UC/OM group, while protein (146%), iron (101%) and vitamin A (120.0%) reached the RDAs in the NC/NM group. The higher energy intake of children in the NC/NM group confirms the findings that increased energy-protein intake were related with improved physical growth.[23,24] Furthermore, adequate iron intake of the children in the NC/NM group might also be an influencing factor to better nutritional status (Table 5).

Vitamin A intake of mothers in both groups was adequate. In the UC/OM group, mothers had significantly lower intakes of energy, protein, fats, carbohydrates and ascorbic acid than the NC/NM group. The same pattern was observed in nutrient adequacy. The results suggest that mothers in the UC/OM may have reduced their food intake considering that 66% of them perceived themselves to be fat to very fat. However, data on how long this lowered energy intake was practiced to cause reduced weight, was not collected in this study. It can also be that there was greater underreporting of food intake by obese individuals as has been found in previous studies.[25-27]

Food intake of both child-mother pairs in the two groups did not influence their nutritional status. This can be attributed to the known interplay of factors each having a direct or indirect role on nutritional status. Apart from this, the use of the 24 h food recall might have encountered the problem of underreporting. Underestimation of dietary energy intake in relation to requirements has been a consistent finding in much of the literature on food consumption. Deliberate fabrication, failure to remember food items or whole eating events, lack of knowledge of the composition of mixed dishes and inability to estimate portion size accurately have all been considered as potential contributors to the underreporting problem.[25-27]

Food behaviour of child-mother pairs

In Fig. 2, children's preference of meats, fried foods, sweets and sugars were significantly associated with

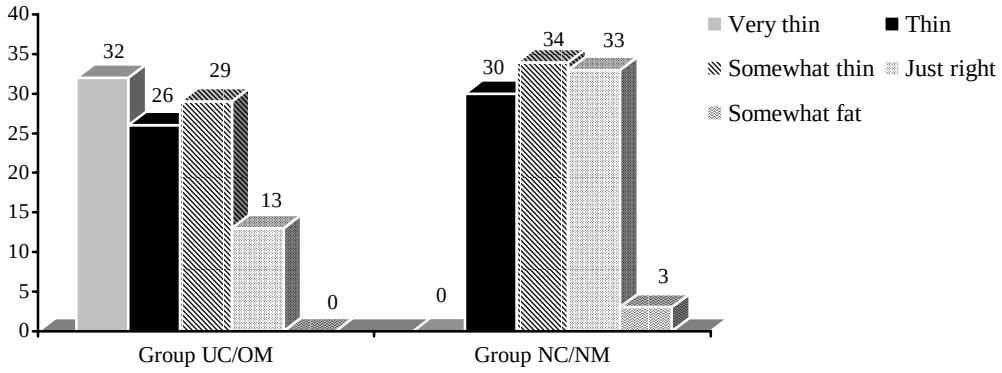

Figure 6. Mother's perception of her child's body size

nutritional state ($P<0.05$). This is consistent with other studies on the eating behaviour of American-Indian children that revealed frequent consumption of high-sugar foods and high-fat-fried foods.[28] Streetfood vending are fast-growing in Metro Manila, especially in school vicinities, leading to easy accessibility to high-fat-high-caloric foods that are affordable and very attractive to children's taste.

The preferences of mothers for meats and fried foods coupled with the predominant home cooking method which was frying (UC/OM = 45%, NC/NM = 53%), may give rise to the prevalence of obesity. Obesity is a risk factor of chronic diseases like cardiovascular diseases, diabetes mellitus and certain types of cancers.[29,30] It is of high priority therefore, that, nutrition education messages/ efforts should be designed to address both undernutrition and overnutrition, taking into consideration different factors: socioeconomic, environmental, cultural, feeding practices and dietary exposures of target clientele.

Children in both groups avoided eating vegetables because they disliked the taste and mothers reported that their children have the feeling of indigestion. Vegetables are regarded as sources of vitamins and minerals. It has been reported that green leafy vegetable diets (400RE/ child) significantly enhance the vitamin A status of children.[31] In this study, the high levels of vitamin A intake mainly came from animal sources (meat & poultry). It should be noted, however, that the vitamin A data from the 3-day 24-hour food recall does not reflect the vitamin A status of the respondents, considering the limitations of the 24h food recall in estimating food, especially micronutrient intakes. The avoidance of vegetables, which are important sources of fibre, flavonoids and vitamin C (especially green leafy) in their child's meal, may result in other health problems like constipation, other colonic disturbances and infections.

On the other hand, some mothers in both groups said that although they preferred meat and poultry, fats and oils, sweets and sugars, there are periods when these foods were avoided due to the presence of illness like hypertension.

Physical activity

The total energy expenditure (TEE) of children in the UC/OM group was significantly higher than the NC/NM group (Fig. 4). Glancing at our data on dietary intake, the lower energy intake of children in the underweight/ overweight group than their normal peers suggests that these children were experiencing an energy imbalance, wherein energy expenditure exceeded energy intake over a considerable period resulting in underweight. Similar findings were reported by a study on children and youths which demonstrated an inverse relationship between physical activity and adiposity.[32] Exercise started in childhood may help prevent obesity and may be crucial for good mood and psychological state.

Mothers in UC/OM group had higher total energy expenditure (TEE) than those in the NC/NM group (Fig.4). It can be seen that this same group of mothers (underweight/overweight) have reported a lower energy intake than their normal counterparts. If we consider this information at face value, it can be deduced that these mothers were experiencing negative energy balance which could lead to lower body weight. However, it should be considered that although changes in body weight are often used to indicate energy balance, this may be misleading when concomitant changes in body composition are not known.[33] For example, in the present study only weight/height ratios were used as an indicator for overweight.

We also should not discount the contribution of other factors leading to obesity, apart from energy intake and energy expenditure. Body weight is primarily regulated by a series of physiological processes and is also influenced by external societal, cognitive, and genetic factors. Another possible reason for the result might be due to the inadequacy of the tool used to collect the data. Since the present study used a 24-h physical activity recall, the differences between groups might be a methodological bias rather than being caused exclusively by differences in TEE. Errors might have been in the reporting of mothers on the activity undertaken and the amount of time spent in a certain activity.

Mothers' perception on nutritional status

The perception of mothers on her body size is significantly related to their nutritional status. About 38% of overweight mothers still considered their body size as somewhat thin and just right while only 13% said that they were fat and 7% as very fat. In the normal/normal group, about 34% considered themselves as still thin and somewhat thin (Fig. 5). Since 38% of overweight mothers and 34% of normal mothers had misperceptions of their body size, appropriate action addressing each specific situation seems difficult. Overwhelming evidence has shown the relationship of obesity as a predisposing factor to degenerative diseases like diabetes, hypertension, cardiovascular diseases and cancer.[29,30] Undernutrition may lead to a higher risk of abortion and miscarriage and low productivity.

Mother's perception of their child's body size is also related to child's nutritional status (Fig. 6). In the UC/OM group, about 13% considered their child's body size as just right while in the NC/NM group, 64% of the mothers considered their children as either thin or somewhat thin. This information was supported by the data of mother's preference to children's body size in a baby contest. About 16% of the mothers in the UC/OM group and 17% in the NC/NM group preferred children who are either thin or somewhat thin while about 39% (UC/OM) vs. 37% (NC/NM) preferred children who are somewhat fat to very fat to be more attractive.

The incorrect perception of mothers of their child's body size in the UC/OM group and their attraction to thin children might pose a greater risk of worsened nutrition condition of their children because mothers might not provide extra childcare, especially on the quality and quantity of food intake. These children might suffer from the negative consequences of undernutrition, like poor school performance, stunted growth and decreased immune response. On the other hand, mothers in the NC/NM group who perceived their children's body size as thin (17%) might have the tendency to binge feed their children that might cause them to become overweight.

Children who are overweight are more likely to have hypertension and high blood lipid levels. They have respiratory, orthopaedic, dermatological problems such as significant rashes and impetigo, immunologic, as well endocrine problems.[34] Furthermore, another study revealed that childhood obesity is a predisposing factor to adult obesity.[35]

Conclusion and recommendations

Results showed that the different factors associated with the existence of under/overweight or normal/normal status in this study were: mother's educational level, mother's occupation, and number of children in the family; energy intake, the preference for meats, sweets and sugars among children while meats and fried foods among mothers; and mother's perception on body size. Physical activity was significantly higher in the UC/OM than the NC/NM group.

The problem of under/overnutrition in one household poses enormous challenges. Although this study cannot make an inference to the whole population, the results indicated that there is a need to consider that public health programs should be focused on appropriate diet and lifestyle patterns like fostering of regular physical activity habits that will lead to optimal health outcomes at both ends of the spectrum of nutritional status. Problem-based nutrition education messages should be designed with reference to the Dietary Guidelines for Filipinos.

Data obtained from 24h food recall could be enhanced by using other dietary assessment methods like food frequency. Likewise, the use of a 24-hr activity recall should be supplemented with other methods to measure TEE, such as the more reliable accelerometres. More studies with larger sample sizes are needed in order to develop programs and evidence-based policies that could effectively address the existence of the double burden of malnutrition on a population's health, nutrition, and productivity.

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