Original Article

Maternal awareness of health promotion, parental and preschool childhood obesity

Sandra C. Buttigieg, Judith Townsend Rocchiccioli, Maria L. Ellul

Abstract

Aim: To investigate the association between parental and preschool childhood obesity, as well as maternal awareness of public health promotion on healthy eating with parental and preschool childhood obesity.

Methods: Data were collected by measuring the height and weight of two hundred randomly selected three-year old children and their parents. Details of the early feeding and dietary styles and level of health promotion awareness were assessed in face-to-face structured health interviews with the parents.

Results: There were statistically significant relationships between childhood obesity and parents' obesity (r=0.2; $p<0.001$). A higher proportion of overweight and obese preschool children showed that their mothers lacked awareness of health promotion as compared to children with normally accepted weight (χ^2 (6, n=200)=17.32, p=0.008). Maternal awareness of health promotion on healthy eating appeared to have a protective effect against overweight/obesity in three year old children (odds ratio=0.38, 95% CI=0.20 to 0.70). Furthermore, a higher proportion of overweight/obesity mothers had no awareness of health promotion as compared to mothers with normally accepted weight (χ^2 (4, n=200)=13.29, p=0.01). Maternal awareness of health promotion appeared to also have a protective effect against overweight/obesity in mothers (odds ratio=0.51, 95% CI=0.28 to 0.95).

Conclusions: This study showed the protective effect of maternal awareness of health promotion on maternal and preschool childhood obesity. Additionally, this study showed that overweight and obese preschool children had parents who were also overweight and obese.

Keywords

Preschool childhood, parental, obesity, health promotion

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Introduction

Obesity is a well-recognised public health problem among children, adolescents and adults across the world.[1,2] According to the World Health Organization, obesity is a major health concern with more than 1 billion overweight adults and at least 300 million of them obese.[3] In adults, excess body weight is defined as having a Body Mass Index (BMI) of ≥25 kg/m^2; obesity, as having a BMI of ≥30kg/m^2; and pre-obesity, as having a BMI of 25.0–29.9 kg/m^2. Adults are overweight if they have a BMI of 25.0–29.9kg/m^2.[1]

The incidence of childhood obesity is also rising throughout the world[4] and has been labelled as a pandemic of the new millennium.[5] WHO provides the use of the weight-for-height index for the classification of overweight in preschool children. This index is defined as a weight-for-height greater than +2 standard deviations (SDs) of the United States National Center for Health. Furthermore, the WHO 2006 Standards provide BMI-for-age values that can be used for the early detection of a growth pattern leading to increased obesity risk. Overweight is defined as a BMI ≥85th percentile and obesity as a BMI ≥95th percentile.[1] At least one in ten school-aged children worldwide is overweight and within that estimate, two to three percent are obese.[5] Obesity appears to be reaching epidemic proportions even in children less than five years old with a global estimate of twenty-two million children being overweight[6] and according to the International Obesity Task Force global estimates based on WHO data, three percent being obese.[3] The obesity epidemic is especially evident in industrialised nations, in particular the

United States, where many people live sedentary lives and eat more convenience foods, which are typically high in calories and low in nutritional value.[4]

Malta is no exception. Within the 25-64 age groups, 34% of women and 22% of men are obese. By the age of 10 years, 19% males and 24% females are obese.[8] The majority of the Maltese lead a sedentary life with only three out of ten people undertaking physical activity during their free time.[9] Additionally, one third of school-entry aged cohort having a mean age of 5.8 years carry excess weight.[10]

Childhood obesity is considered to be the result of the interaction of genetic, metabolic, behavioural and environmental factors.[11] Amongst the behavioural and environmental determinants the most predominant would be the families' knowledge and confidence about healthy weaning and feeding of their young children. The parent influences the child by shaping eating environments. A review paper[12] revealed a bidirectional influence in the causal relationship between parenting and children's eating practices and weight status. Of particular interest are studies that show that parents of overweight/obese children keep denying the problem and neglect the opportunities for nutritious diet and physical activity.[13,14] Additionally, poor maternal nutrition is now recognised as a risk factor for the development of obesity, and particularly abdominal adiposity among offspring.[15]

This study attempts to contribute to knowledge by investigating the association between parental and childhood obesity, as well as maternal health promotion awareness on healthy eating with parental and childhood obesity.[3] Therefore the study focuses on a critical period in the lifecycle, namely maternal care of preschool children, when women are more likely to be receptive to health promotion/education messages. The WHO Ottawa Charter in 1986[16] defined health promotion as the process of enabling people to increase control over, and to improve their health. Furthermore, the Jakarta Declaration in 1997[17] on leading health promotion into the 21st century identified health literacy as one of the critical strategies and action areas. According to this declaration, health literacy fosters participation, and provides access to education and information in an attempt to empower people and communities in achieving health lifestyles. Health promotion messages to expectant mothers also include breastfeeding apart from healthy eating. There is increasingly persuasive evidence that breastfeeding protects against later childhood and adolescent obesity.[21,22] The number of women who start pregnancy overweight and obese is increasing. Consequently, more children are born with high birth weight (exceeding 4.5kg).[2,19] Lack of knowledge on the benefits of breast-feeding and healthy balanced diet, as well as on the negative effects of excess calories on the child's weight encourage families to develop obesity from a young age and ultimately results in obesity and its related illnesses later on in the adult years as obesity tracks, as empirical findings consistently show across countries.[21,23] It is therefore pertinent to state that at the micro-level, policies concerned with maternal and infant services impinge heavily on the prevalence of national obesity levels in any community.[24]

Methods

A sample of two hundred three-year-old children and their parents was recruited randomly from the Maltese public registry list. In a priori power analyses, the sample size of 200 was calculated using G*Power 2[25] as a function of the required power of 0.95 (1 - β), the prespecified significance level α of 0.05, and the population medium effect size of 0.3. The study was carried out in 2006 and it took one year to complete. Two random samples of two hundred each were obtained, namely the main and the replacement samples. The parents were sent an invitation letter to participate in the study. The initial response was from one hundred and eight children (54%). Further invitations and active tracing of the non-respondents provided a further response from twenty-four children (12%) and a total of 66% response rate. The remaining forty-four children (34%) were drawn up from the replacement sample. Approval from Maltese health authorities, the University of Malta ethics' board, as well as informed consent from the parents of the children were obtained on the day. The interview and examination for each child and parents took approximately thirty minutes to complete. The interview and examination schedule (Table 1) was piloted before the study. The schedule was deemed to be clear and no changes were made.

This study specifically analysed three-year old children's weight and height, parental weight and height, socioeconomic status, as well as details of the children's early feeding and dietary styles. For socio-economic status the following dimensions were used: non-manual and manual workers for fathers using the WHO classification of social class; non-working and working mothers; and for both parents, the educational level ranging from secondary school education to tertiary level. The additional use of the hospital pregnancy card and baby book enhanced the objectivity of the data gathered during the interview.

Data of height and weight were also collected using the same standard calibrated scales (BEURER PS07 Digital Scales) and stadiometer (SECA 214 Portable Stadiometer). The nutritional status of the three-year old children was evaluated by comparing their weight-for-height and weight-for-age measurements using the Centers for Disease Control and Prevention 2000 growth charts as a reference[26] through the Centers for Disease Control and Prevention EpiInfo 3.2.2. The exact date of birth was recalled so that the exact age was computed. A child's nutritional status is defined as acceptable when these indices fall within the range of 80-100% $\pm$ 2 standard deviations (using Z scores) of the reference values. There is however still lack of global consensus as to the accepted definitions for overweight and obesity in preschool children.[27] For this study, overweight was considered as being between 75th and 97th, and obesity as more than 97th weight-for-height percentiles. The weight and height of both parents were also measured and their nutritional status was evaluated using the BMI. BMI was calculated as

weight/height (kg/m^2). For parents, overweight was considered as 25-30kg/m^2 and obesity as more than 30kg/m^2.

The type of diet adopted was assessed by documenting the number of times a specific food item was eaten weekly. Parents were asked to rate the child's prioritised nutritional input as regards wheat products, eggs, meat products, white meats, fruits, vegetables, dairy products, confectionaries, and mineral drinks. The preference scores were obtained by giving eight points to the first preference and zero points to the ninth preference. Finally, health promotion awareness was assessed by rating whether mothers knew, read, remembered and practised health promotion messages on nutrition. The Department of Health Information in Malta published information leaflets in 2005-2006 to promote a balanced diet through the healthy eating food pyramid, to reduce salt intake, and sugar intake, as well as to encourage physical activity.[28] The Department had also provided information at the time about the dangers of high cholesterol and high blood pressure. National media campaigns had been broadcasted to promote more fruit and vegetable consumption. In this study, parents were shown leaflets issued by the Department of Health Promotion[28] on healthy eating habits and asked whether they were aware of the leaflets. These leaflets were specifically chosen for this study because of their clear messages and as a reminder of the above mentioned widespread campaign. If the parents answered "no", they were classified as having *no awareness*. If they answered yes, they were then asked: "Can you recall any statements in these leaflets?" If they did correctly recall these statements, they were further asked whether or not they agreed and practised the messages. If the parents were successful in all questions, they were classified as having *full awareness*, whereas if not they were classified as having *moderate awareness*. Although both parents were present during the interview, mothers were the most active in answering questions on awareness of health promotion, hence referred to in the study as maternal awareness.

Data analysis was performed using SPSS 17. Following an initial descriptive analysis, Pearson product moment correlation was used for correlations between variables whereas the Chi-square test for independence was used to test for statistical differences with a p value of < 0.05 being considered significant.

Table 1: *A schematic outline of interview and physical examination*

Demography	• Date of birth of child • Geographical location • Working/Non-working mothers • Occupation of father • Education level of parents
History of child	• Birth weight • Breastfeeding/Artificial feeding • Weaning • Dietary patterns
Awareness of health promotion campaign on healthy eating	• No • Moderate • Full
Physical examination of child	• Height • Weight
Physical examination of parents	• Height • Weight

Results

Characteristics and Demographics of Cohort

The baseline characteristics and demographics are shown in Table 2. Seven percent of the three year-old cohort had a birth weight greater than four kilograms but there was no statistically significant correlation (r=0.038) between birth weight and weight-for-height percentiles of the three year old children. A significant negative correlation was found between birth weight and working mothers (r=-0.16, $p<0.05$), however no statistical significant correlations were obtained for the other socio-economic indicators, namely higher social class (r=-0.05) and higher educational attainment (r=-0.08 for mothers; r=-0.07 for fathers). There was no statistical significant correlation between breast-feeding and weight-for height percentiles of the three-year old children in this study.

Weaning

As regards weaning, this is defined as the process by which a baby relies less on breast milk as they are introduced to family or adult foods.[1] This study found the introduction of soluble biscuits with artificial milk as early as the second month after birth. This appeared to be a popular weaning practice in Malta. The modal ages of weaning for other food items are listed in Table 3.

Diet of Preschool Children

The preference scores for dietary styles in the three-year old children (Table 4) showed that dairy products, fruit, wheat products, and vegetables were the most commonly eaten products.

Relationship between childhood obesity and parental obesity

There were statistically significant relationships between childhood obesity and parents' obesity (r=0.2 for both mothers and fathers; $p<0.001$). Table 5 shows that a higher proportion of obese and overweight preschool children had mothers with body mass index above 25 as compared to children with normally accepted weight ($\chi^2(8, n=200) = 34.85, p<0.001$).

This finding suggests that mothers with a high BMI are more likely to have children who are overweight.

Maternal awareness of health promotion and obesity

Table 6 shows that a higher proportion of obese and overweight preschool children had no maternal awareness of health promotion/health education as compared to children with normally accepted weight ($\chi^2(6, n=200) = 17.32, p=0.008$).

Full maternal awareness of health promotion on healthy eating appeared to have a protective effect against the development of obesity/overweight in three year old children (odds ratio=0.38, 95% CI=0.20 to 0.70). Table 7 shows that a higher proportion of obese and overweight mothers had no awareness of health promotion/health education as compared to mothers with normally accepted weight ($\chi^2(4, n=200) = 13.29, p=0.01$).

Full maternal awareness of health promotion on healthy eating appeared to also have a protective effect against the development of mothers' obesity/overweight (odds ratio=0.51, 95% CI=0.28 to 0.95). This result was not statistically significant for fathers ($\chi^2(4, n=200)=4.57, p=0.33$).

Table 2: *Baseline demographics of the sample. Data are shown as n (%)*

Variables	***3-year old children n=200***	***Mothers n=200***	***Fathers n=193***
Gender	94 boys 106 girls		
Overweight	52 (26)	75 (37.5)	93 (46.5)
Obesity	25 (12.5)	33 (16.5)	42 (21)
Birth weight			
<2.0 Kg	1 (0.5)		
2.0 - 3.0 Kg	46 (23)		
3.0 - 4.0Kg	139 (69.5)		
>4.0kg	14 (7)		
Breast feeding			
< 6 weeks	108 (54)		
6 weeks	77 (38.5)		
15 weeks	46 (23)		
30 weeks	27 (13.5)		
Awareness of health promotion activities			
No awareness		86 (43)	
Moderate awareness		30 (15)	
Full awareness		84 (42)	
Manual (Non-Manual)*			73(120)
Working (Not-working)		35 (165)	
Level of education			
Secondary		83 (41.5)	76 (39.3)
Post-secondary		104 (52)	92 (47.7)
Tertiary		13 (6.5)	25 (13)

Discussion

This study reconfirmed the association between parental overweight/obesity and preschool childhood overweight/obesity as found in previous studies,[2,29] which might be explained by both genetic and environmental influences. This study also showed two interesting findings. The first was the rather low level of breastfeeding, namely 13.5% at 30 weeks when compared to a recent Maltese study,[30] which showed that 38% still breastfed at six months of age. The second was that weaning was started at two and a half months and therefore much earlier than what is recommended by WHO[1], namely six months. There are several possible reasons for the link between these two findings and obesity in this cohort and which are substantiated by the literature. Babies, who are bottle-fed, may not be able to self-regulate appetite particularly if the standard bottle portion is expected to be fully consumed at a feeding session.[1] In addition, bottle-fed infants are weaned earlier and consume higher calorie weaning food than breastfed ones.[1] Indeed, this cohort showed both low breastfeeding rates and early weaning of high calorie food in the form of soluble milk biscuits. Finally, this research also confirmed the important association between maternal awareness of health promotion on healthy eating as a measure of parental health literacy with maternal and preschool childhood overweight and obesity. Parental health literacy therefore appeared to have an impact on the choices as documented above.

Several authors[11,29,31-32] have previously before linked the interaction of genetic, metabolic, behavioural and environmental factors as potential aetiological factors of obesity. Similarly this study attempted to focus on factors which can be explained in terms of their genetic and/or environmental link, namely the association of childhood obesity with parental obesity and the shaping of the young family environment in making healthy choices. The prevalence of excess weight in children and adults computed from this study matched well with reports and studies published previously.[3,9,10] The high prevalence of obesity in Malta across all age groups is strongly indicative of an obesogenic environment which is further enhanced in sectors of the population who lack the health literacy to enable healthy behaviour. There may also be lack of financial resources in some strata of the population to sustain healthy eating.

While studies on twins[32] highlighted the genetic influence, Kleiser[2] argued in favour of gene-environment intervention as a better explanation for the global increase in obesity rates. Young children are dependent on parents and caregivers for feeding

thereby making parents' choices about feeding key determinants of children's eating patterns. The finding in this study, that mothers with a high BMI are more likely to have children who are overweight, also begs the need for pre-pregnancy health and diet teaching in order to promote healthy choices in the forthcoming critical periods in the mothers' lifespan. The mothers' literacy levels in particular played a significant role in determining the children's body weight through their direct influence on weaning, choices on healthy eating and general eating practices. Despite the fact that by and large, parents made healthy dietary choices, the explanation of the mothers' literacy levels of health promotion in this study appeared to go

Table 3: *The modal ages of weaning/months after birth for this study cohort of two-hundred three year old children*

Food item	***Cereal***	***Fruit***	***Vegetables***	***Biscuit/milk***	***Egg***	***Meat/poultry***
Months	3.5	3.5	4	2.5	12	12

Table 4: *The preference scores (order) of the food items in the diet of for this study cohort of 200 3-year old children*

Food item	***Wheat products***	***Egg***	***Meat products***	***White meats***	***Fruit***	***Vegetables***	***Dairy products***	***Confectionery***	***Mineral drinks***
Score	1193	550	268	463	1227	996	1374 (1)	808	357
(Order)	(3)	(6)	(9)	(7)	(2)	(4)		(5)	(8)

Meat products: pork, ham, sausages; white meats: rabbits, chicken, fish

Table 5. *Cross-tabulation mothers' Body Mass Index and Weight-for-height percentiles of 3-year old children*

Body Mass Index mothers	***Weight-for-height percentiles of three year old children***					***Total***
	0-2	***25-49***	***50-7***	***75-96***	***97-100***	
15-24.9	25	20	19	22	6	92
25-29.9	14	7	23	21	10	75
30 and above	3	4	8	9	9	33
Total	42	31	50	52	25	200

Table 6: *Cross-tabulation of maternal awareness of health promotion and weight-for-height percentiles of 3-year old children*

Awareness of health promotion	***Weight-for-height percentiles of 3-year old children***				***Total***
	0-24	***25-74***	***75-96***	***97-100***	
No awareness	18	25	29	14	86
Moderate awareness	5	14	4	7	30
Full awareness	19	42	19	4	84
Total	42	81	52	25	200

Table 7*: Cross-tabulation parental awareness of health promotion and Body Mass Index of mothers*

Awareness of health promotion	***Body Mass Index of mothers***			***Total***
	15-24.9	**25-29.9**	**30 and above**	
No awareness	36	36	14	86
Moderate awareness	7	14	9	30
Full awareness	49	25	10	84
Total	92	75	33	200

beyond the quality of the diet. Other factors, namely quantity of food eaten, level of physical activity, recall bias and social desirability might explain the mismatch between obesity and dietary choices in this study.

Of great note is this study's contribution to knowledge in recommending a simple and relatively cheap strategy, mainly that of ensuring health promotion awareness as effective action against overweight and obesity. Both the WHO Ottawa Charter in 1986[16] and the Jakarta Declaration in 1997[17] identified health literacy as one of the critical strategies to stimulate access to information and to empower people to adopt healthy lifestyles. Several authors referred to the protective effect of parental education in childhood obesity.[21,33] Unlike other studies, this study did not achieve statistically significant associations between socio-economic status and obesity, as well as between breastfeeding and preschool obesity.[21,22]

Preschool childhood dietary patterns in this study revealed healthy choices as top priorities, yet the study cohort still registered a high prevalence of overweight and obese preschool children. This may be explained by the early introduction of westernised fast foods such as burgers and sausages, rather than consisting entirely of items that form part of the much acclaimed Mediterranean diet and lack of physical activity, the level of which was not assessed in this study. Furthermore, despite the fact that the top choice, namely dairy products are considered as healthy, the parents might still have continued to use the artificial milk products which are high in calories. This might be a plausible explanation due to the documented use of biscuits which are soluble in milk. This assertion was however difficult to prove in the study due to the standardised format of the questions.

This study has weaknesses and strengths. First, the study included a modest sample size of two hundred preschool children and two hundred parents. Therefore, it would be useful if the results were to be verified in a larger study. Second, this study did not look at the level of physical activity because since it focussed mostly on three year old children, we felt that it was a problem to gauge it objectively for this age group. Therefore, despite the intake of a healthy diet, a potential explanation for the overweight and obesity suffered by the children in the study might be the lack of adequate physical activity. Additionally, mothers who were more aware of health promotion issues might also have engaged their children in more physical activities. Third, the 2000 growth charts (through the Centers for Disease Control and Prevention EpiInfo 3.2.2) used as reference in this study, were not validated for Maltese children. Fourth, the tool used during the interview to gauge dietary priorities and health promotion/education awareness was a self-report measure with its inherent biases of recall, and acquiescence. Furthermore, the measuring tool was only intended to capture awareness of specific health promotion/education messages issued by the local Department of Health and therefore potentially missed awareness of healthy messages arising from other sources. The strengths of the study are related to the uniformity of the anthropometric measurement of both children and parents by the same researcher and using the same clinic and instrumentation. Furthermore, non-response bias was eliminated by using the replacement sample although again, in doing so the researchers reduced the representation of the sample to the general population.

Conclusion

This study demonstrated that maternal awareness of health promotion/health education had a protective effect against maternal obesity and preschool childhood obesity in Malta. Additionally, this study showed that overweight and obese preschool children had parents who were also overweight and obese.

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Bayer-Pharma Prize in Obstetrics & Gynaecology

The Bayer-Pharma Prize in Obstetrics & Gynaecology for the academic year 2011-12 was awarded to Dr. Paul Torpiano, who obtained the highest aggregate mark in the speciality during the final examinations of the Medicine and Surgery course. The prize was hotly contested by the eleven other student candidates who were also awarded a distinction grade during these examinations – Dr. Christopher Barbara; Dr. Gianluca Bezzina, Dr. John Bonello; Dr. James Savior Borg; Dr. Emma Louise Brincat; Dr. Raphael Buttigieg; Dr. Mark Cachia Markham; Dr. Michael Farrugia; Dr. Matthew Lapira; Dr. Katya Muscat; and Dr. Carl Tua. Their achievement has been rewarded by a small book token. Congratulations are due to all these candidates. In the accompanying photograph, Dr. Torpiano is seen receiving a cheque for €250 from Mr. Simon Delicata, representing Bayer-Pharma.