Abstract

Objective: Recent studies have reported a positive association between paid work hours of mothers and obesity in their children. Like most of other hospitals, nurses at our center work either on irregular shifts or on a regular basis. The aim of this study was to analyze factors affecting the weights of the children of female nurses.

Material and Methods: We evaluated 100 children of female nurses on duty at our hospital. We prepared a questionnaire including details such as the gender of the child, birth-weight, education level and working status of both parents, duration of breastfeeding, age at which supplementary food was first introduced, exercise habits, snacking habits, and identity of caretakers while the mothers were at work. We calculated the body mass index percentiles using standard growth charts.

Results: According to the standard body mass index percentiles, 13 children were underweight, 53 had normal weight, 14 were overweight, and 20 were obese. The weight patterns of children were positively associated with regular maternal workstyle (p=0.016), frequency of snacking habits (p=0.003), and caesarian birth (p=0.04). Children of nurses working on shifts were more likely to be underweight compared to those working on fixed schedules. There was no association between the weight patterns of children and education levels of parents, working status of fathers, duration of lactation, birth-weight, gender, order of birth, and supplementary food consumption patterns.

Conclusion: Irregular working hours of mothers can cause irregular and insufficient nutrition for their children. The mother is generally unable to supervise the child during feeding hours. These findings need to be confirmed through more studies on a large scale.

Keywords: Childhood obesity; maternal work style; nurse

Work Patterns of Mothers Influence the Weights of Their Children

Annelerin Çalışma Şekli Çocuklarının Vücut Ağırlıklarını Etkilemektedir

Umut Mousa
Burhan Nalbantoğlu Hospital, Clinic of Endocrinology and Metabolism, Lefkoşa, TRNC

Amaç: Yakın geçmiştte yapılan çalışmalarda, annenin maşılı çalışma süreleri ile çocukluk obezite arasında pozitif ilişki saptanmıştır. Birçok hastanede olduğu gibi, hastanemizde de hemşireler düzenli vardiya yapan da mesai usulu çalışmaktadır. Bu çalışmada, kadın hemşirelerin çocukların vücut ağırlıklarını etkileyeceği olan bazı faktörler incelenmiştir.

Gereç ve Yöntemler: Hastanemizde çalışan kadın hemşirelerin toplam 100 çocuğu çalışmaya dahil edildi. Çocukların cinsiyeti, doğum ağırlığı, her iki ebeveyninin çalışma şekilleri, her iki ebeveyninin eğitim durumu, anne sütü alma süresi, ek gıdaya başlama yaşları, egzersiz alışkanlıkları, artıştırma alışkanlıkları, anne çalışan bakıcının kim olduğulu ile ilgili bir anket hazırladık ve her çocuk için dolduruldu. Standart büyüme eğrileri kullanarak beden kitle indeksi persentilleri hesaplandı.

Bulgular: Standart beden kitle indeksinde persentillerine göre çocukların 13’ü düşük kilolu, 53’ü normal kilolu, 14’ü fazla kilolu ve 20’si obez olarak hesaplandı. Çocukların ağırlıkları annenin düzenli mesai çalışması (p=0,016), atıştırma alışkanlıkları (p=0,003) ve sezaryen doğum (p=0,04) ile ilişkilidir. Vardiya usulu çalışan hemşirelerin çocuklarının mesai çalışan hemşire-çocuklarına göre daha çok düşük kilolu olan eğilimde idi. Çocukların vücut ağırlıkları ile ebeveynlerin eğitim durumu, babanın çalışma şekli, anne sütti alma süresi, doğum kilosu, cinsiyet, doğum sırası ve ek gıdaya başlama yaşları arasında ilişki saptanmamıştır.

Sonuç: Annenin düzenli çalışma şekillerinin çocuklarının ağırlıklarını etkilediği ve yetersiz beslenemelerine yol açabildiğimiz bulgularımız doğrulanmalıdır.

Anahtar kelimeler: Çocukluk obezitesi; anne çalışma şekli; hemşire
Introduction

Obesity is a medical condition in which so much adipose tissue has accumulated in the body, that it has an adverse effect on the person’s health (1). Childhood obesity is one of the major public health problems worldwide (2). Childhood obesity is estimated to affect 20-30% of the population in western countries (3). Factors leading to childhood obesity are complex and include genetics, neurology, environment, physiology, sociocultural conditions, and ecology (3, 4).

Parental efficacy, especially maternal efficacy, has been linked to obesity (5). The influence of maternal employment in the development of childhood obesity has garnered the interest of several researchers. Recent studies have established a positive association between maternal paid work hours and pediatric obesity (6, 7). Longer work hours have been suggested to lead to insufficient family interactions. Also, mothers working long hours have insufficient time to prepare nutritious meals and supervise their child’s physical activity (8). In contrast, a recent study reported that childhood obesity was associated with irregular work schedules of fathers (9). Furthermore, this study found no association of obesity with maternal work schedule.

Health personnel in most of health units and hospitals are either on call or need to complete the shift work. The parent’s time at home as well as the time they spend with their children is not fixed. A study performed on nurses and midwives demonstrated that cumulative night-shift work was positively correlated with their own body mass index, waist circumference, hip circumference, and waist/hip ratio (10). However, limited data on their children was available.

The nurses in our hospital comprise a heterogeneous group in terms of education level and working status, along with other factors including age, number of children, and so on. Hence, we aimed to analyze some factors influencing the weight of the children of female nurses.

Subjects and Methods

This study was approved by the Dr. Burhan Nalbantoglu Ethical Committee. We had obtained written informed consent from the children’s parents.

This study was performed on children of nurses working at the Burhan Nalbantoglu state Hospital in Nicosia, Cyprus. Regular working hours at this hospital were from 07:30 am to 03:30 pm. Nurses on a regular schedule worked from Monday to Friday. However, the majority of the nurses worked on either of three shifts: 07:00 am to 02:00 pm, 02:00 pm to 09:00 pm, and 09:00 pm to 07: 00 am. The shifts were completely irregular, and a nurse could be assigned any shift on a given day. Nurses working on shifts needed to clock approximately 40 work hours per week. When extra personnel was needed, these nurses would be asked to work overtime. Nurses working on irregular shifts were working in the same format since their first day of employment. Nurses working regularly either had previous experience of shift work or worked regularly since their first day of employment. Nevertheless, they had been working regularly since they had given birth.

The female nurses who worked at our hospital in the same work format since their child was born, who were not divorced, and had at least one child between 2-18 years of age were eligible for the study. A total of 158 female nurses met the criteria. Of these, 120 nurses were working on shifts and 38 were working regularly. Fifty-nine nurses agreed to provide information about their children. Thus, we included 100 children of 59 nurses in this study. We prepared a questionnaire including details such as the gender of the child, birth weight, education level and working status of both parents, the duration of breastfeeding, age at which supplementary food was first introduced, exercise habits, snacking habits, and identity of the caretaker while the mother was at work. The questionnaire form was filled by the participating nurse and was checked by the researcher.

Because of the unavailability and high cost of techniques directly measuring body fat, body mass index (BMI), which is the widely accepted clinical standard identifier of overweight and obese children (2), was used for this study.

The child's body weight was measured to the nearest 0.5 kg and height to the nearest 0.5 cm by the same researcher. The BMI was calculated using the formula:

\[ \text{BMI} = \frac{\text{weight (kg)}}{\text{height}^2 (\text{m}^2)} \]

BMI percentiles and Z-scores were calculated using standard growth charts established by the Center for Disease Control and Prevention (CDC) (11). Children with BMI percentile <5% were considered underweight; those between 5-84% to be normal weight; 85-94% to be overweight; and 95% to be obese.
Statistical Analysis

We used the statistical program SPSS version 15.0 for Windows. We used chi-square tests and descriptive statistics for analysis of categorical data. We used logistic regression analysis for interpretation of independent variables. A two-sided p-value 0.05 was statistically significant.

Results

We analyzed data from 100 children of female nurses on duty at our hospital. The median age of the children was eight years, and range between 2 and 18 years. The female nurses included in our study were aged between 32 and 46 years, while their median age was 39 years. All nurses were working in the same work format since the birth of their child. The median birth weight was 3000 grams. Only three children weighed less than 2000 grams at birth. The birth weights of many children (69; 69%) ranged between 3000-4000 grams. The remaining 28 (28%) weighed between 2100-2900 grams at birth. The general properties of the study group are summarized in Table 1. According to standard BMI percentiles, 13 (13%) were underweight, 53 (53%) were normal weight, 14 (14%) were overweight, and 20 (20%) were obese. BMI was not associated with birth order (p=0.164), birth weight (p=0.761), duration of breastfeeding (p=0.872), introduction of supplementary food (p=0.166), father’s working status (p=0.457), physical activity (p=0.08), mother’s education level (p=0.558), and father’s education level (p=0.115).

In Table 2, we present the distribution of underweight, normal weight and overweight/obese children according to risk factors (such as snacking habits, method of birth, identity of the caretaker when the mother is at work, and mother’s work format).

Snacking habits were defined as consumption of high-calorie food, including biscuits, crisps, and chocolate. Adiposity was significantly positively associated with snacking habits (p=0.003). Out of 34 children who were obese or overweight, 23 (67.6%) were reported to consume snacks every day. In contrast, only three out of the 13 children (23.07%) in the underweight group were reported to consume snacks every day. The remaining 10 children (76.9%) were reported to either avoid snacks or consume snacks for only 1-2 times a week. This snacking pattern was reported in only six out of 34 children (17.6%) in the overweight/obese group (Table 2).

| Table 1. General properties of the study group. |
|-----------------------------------------------|
| **Sex**                                      |
| Male                                         |
| Female                                       |
| **Birth Order**                              |
| 1st                                          |
| 2nd                                          |
| 3rd                                          |
| **Method of Birth**                          |
| Normal                                       |
| C/S                                          |
| **Duration of breastfeeding**                 |
| 0-6 months                                   |
| 7-12 months                                  |
| 13-24 months                                 |
| >24 months                                   |
| **Initiation of additional food (months)**    |
| At birth                                     |
| 1                                            |
| 2                                            |
| 3                                            |
| 4                                            |
| 5                                            |
| 6                                            |
| 7                                            |
| 8                                            |
| 10                                           |
| **Maternal working status**                  |
| Regular                                      |
| Shifts                                       |
| **Paternal working status**                  |
| Regular                                      |
| Shifts                                       |
| **Maternal education level**                 |
| Health School                                |
| Degree in Nursing                            |
| **Paternal Education Level**                 |
| Junior School                                |
| Secondary School                             |
| High School                                  |
| University                                   |
| **Where is the child when mother is at work?**|
| With Father                                  |
| With Grandparents                            |
| At School                                    |
| With Babysitter                              |
| At Home alone                                |
| **Snacking Habits**                          |
| None                                         |
| Every day                                    |
| 1-2/week                                     |
| >3/week                                      |
| **Physical Activity**                        |
| None                                         |
| Once a week                                  |
| 2-4/week                                     |
| Everyday                                     |

C/S: Caesarian sections.
Adiposity was significantly positively associated with the method of birth (p=0.04). Out of the 34 overweight or obese children, 28 (82.3%) were born by Caesarian Section (C/S). In contrast, this ratio was 46.1% and 64.1% in the underweight and normal-weight children, respectively (Table 2). Adiposity was also significantly associated with the identity of the caretaker while the mother was at work (p=0.04). Seven out of the 13 underweight children (53.8%) were looked after by a babysitter, whereas only four of 34 children in the obese/overweight group (11.7%) were looked after by a babysitter (Table 2).

Adiposity was significantly associated with the mother’s working status (p=0.016). The mothers of 12 out of the 13 underweight children were working on irregular shifts (92.3%), while only one worked on a regular basis (7.7%). On the other hand, the mothers of 20 out of the 34 obese/overweight children were working on a regular basis (58.8%), compared to 14 on irregular shifts (41.1%). The median ages and work experience periods of the nurses in both irregular shifts and regular working groups were similar (37 vs. 38, p=0.56; 12 vs. 13, p=0.46). There was no association between children’s’ weight and mothers’ education level, fathers’ education level, fathers working status, duration of lactation, birth weight, children’s gender, birth order, and time of consumption of additional food.

We performed a multivariate logistic regression analysis to define the independent variables for childhood obesity and underweight children. The models were adjusted for snacking habits, identity of the caretaker, mothers working status and method of birth. Regular working hours (p=0.019) and C/S birth (p=0.043) were determined to be independent risk factors for childhood obesity. Furthermore, caregiving by a babysitter (p=0.037) and shift patterns of the mother (p=0.049) were determined to be independent risk factors for underweight children.

**Discussion**

In this cross-sectional study, it was determined that the working status of mothers, snacking habits of children, the identity of the caretaker while the mother was at work, and the method of birth were associated with obesity of children. Childhood obesity is a widespread problem and has been linked to several genetic and environmental factors (2-4, 12, 13).

We demonstrated that the children of nurses working on irregular shifts were more likely to be underweight than those working on fixed schedules. Shift-work has been shown to increase the risk of various health problems, including abdominal obesity (10). However, the impact of parental shift work on their children remains poorly studied.
Parental efficacy, especially maternal efficacy, has been linked to the development of childhood obesity (5). Recent studies have established a positive association between maternal paid work hours and child obesity (6, 7). It is argued that longer work hours lead to insufficient family interactions. Also, long-working mothers have insufficient time to prepare nutritious meals and supervise their child’s physical activity (8). Apart from parental working hours, there has been an increase in the proportion of families with either or both parents working at variable intervals (9). A recent study established that childhood obesity was associated with irregular work schedules of fathers. This study found no association of obesity with maternal work schedule (9).

In this study, we observed no association of paternal work schedule with the child’s adiposity. The duration of work hours of female nurses working on fixed schedules and those on shift work were identical at our hospital and differed only in the regularity of work. The percentage of underweight children was higher in nurses working irregularly, while the percentage of obese children was higher in nurses working regularly. Furthermore, it was also observed that a high percentage of nurses working on shifts left their children to babysitters while they were at work. More children looked after by babysitters were underweight than those taken care of by someone else (father, grandparents, school, home alone). Babysitters may not be able to handle the nutritional support of the child as well as mothers. In addition, children of regularly working nurses were more likely to be overweight or obese. Despite an increase in the proportion of working mothers over the past decades, the domestic tasks continue to depend on the mother, and fathers’ contributions are minimal (14).

An interesting finding of our study was that more children born by C/S were obese/overweight than those born normally. This association was independent of the birth weight. A recent meta-analysis demonstrated that children born by C/S had a 1.34 Relative Risk (95% CI 1.18–1.51) compared to children born normally (17). Another study published later reported similar results in pre-school children (18). The authors showed that children born by C/S faced a 24% more chance of being overweight and 29% higher obesity risk. It has been hypothesized that lack of exposure to maternal gut microbiota in children born via C/S could be a possible biological explanation for the development of obesity in early or later childhood (18, 19).

In this study, we also established some results which were like those previously reported, such as positive correlations between birth by C/S and snacking habits with the development of childhood obesity. Interestingly, maternal shift work was associated with more chances of the child being underweight, while regular working was associated with childhood obesity. Although other members of the family aid in feeding the children, their mother still holds a central role in their nutrition. Thus, maternal work patterns may affect their child’s adiposity levels. These findings need to be confirmed by future studies on a larger scale.

Acknowledgements: Mrs. Oya Adsiz Marasuna helped in the preparation and distribution of the questionnaire.

The abstract of this study was presented in the European Congress of Endocrinology in 2016.

Source of Finance: During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest: No conflicts of interest between the authors and/or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions
This study is entirely author’s own work and no other author contribution.

References
1. Mousa U, Kut A, Bozkus Y, Cicek Demir C, Anil C, Bascil Tutuncu N. Performance of abdominal bioelectrical impedance analysis and comparison with other known parameters in predicting the metabolic syndrome. Exp Clin Endocrinol Diabetes. 2013;121:391-396.
2. Kumar S, Kelly AS. Review of childhood obesity: from epidemiology, etiology, and comorbidities to clinical assessment and treatment. Mayo Clin Proc. 2017;92:251-265.
3. Wang Y, Lobstein T. Worldwide trends in childhood overweight and obesity. Int J Pediatr Obes. 2006;1:11-25.
4. Incledon E, Wake M, Hay M. Psychological predictors of adiposity: systematic review of longitudinal studies. Int J Pediatr Obes. 2011;6:e1-11.
5. Grossklaus H, Marvicsin D. Parenting efficacy and its relationship to the prevention of childhood obesity. Pediatr Nurs. 2014;40:69-86.
6. Kim J, Park EC, Choi Y, Park S. Are Mothers’ Working Hours Associated with General and Abdominal Obesity in Children and Adolescents? The Korean National Health and Nutrition Examination Survey (2008-2012). Matern Child Health J. 2018;22(4):474-484.
7. Mindlin M, Jenkins R, Law C. Maternal employment and indicators of child health: a systematic review in pre-school children in OECD countries. J Epidemiol Community Health. 2009;63:340-350.
8. Morrissey TW, Dunifon RE, Kalil A. Maternal employment, work schedules, and children's body mass index. Child Dev. 2011;82:66-81.
9. Champion SL, Rumbold AR, Steele EJ, Davies MJ, Moore VM. Parental work schedules and child overweight and obesity. Int J Obes (Lond). 2012;36:573-580.
10. Peplonska B, Bukowska A, Sobala W. Association of rotating night shift work with BMI and abdominal obesity among nurses and midwives. PLoS One. 2015;10:e0133761.
11. CDC. 2 to 20 years: Boys Body mass index-for-age percentiles. p.1. https://www.cdc.gov/growthcharts/data/2clinical/cj41c073.pdf
12. Coleman PK, Karraker KH. Parenting self-efficacy among mothers of school-age children: conceptualization, measurement, and correlates. Family Relations. 2000;49:13-24.
13. Ebbeling CB, Pawlak DB, Ludwig DS. Childhood obesity: public-health crisis, common sense cure. Lancet. 2002;360:473-482.
14. Bianchi SM. Maternal employment and time with children: dramatic change or surprising continuity? Demography. 2000;37:401-414.
15. Adams EL, Savage JS. From the children’s perspective: what are candy, snacks, and meals? Appetite. 2017;116:215-222.
16. Ramiro-González MD, Sanz-Barbero B, Royo-Bordón MÁ. Childhood excess weight in Spain from 2006 to 2012. Determinants and parental misperception. Rev Esp Cardiol (Engl Ed). 2017;70:656-663.
17. Kuhle S, Tong OS, Woolcott CG. Association between caesarean section and childhood obesity: a systematic review and meta-analysis. Obes Rev. 2015;16:295-303.
18. Rutayisire E, Wu X, Huang K, Tao S, Chen Y, Tao F. Cesarean section may increase the risk of both overweight and obesity in preschool children. BMC Pregnancy Childbirth. 2016;16:338.
19. Neu J, Rushing J. Cesarean versus vaginal delivery: long-term infant outcomes and the hygiene hypothesis. Clin Perinatol. 2011;38:321-331.