Overweight and obese children do not consult their GP more often than normal-weight children for musculoskeletal complaints during a 2 year follow up

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ABSTRACT

Background

Childhood obesity is associated with self-reported musculoskeletal complaints, injuries, and fractures. In the current study we investigated the association between weight status of children and the frequency and type of musculoskeletal consultations at the GP during a two year follow-up.

Methods

Data from a prospective longitudinal cohort study including children aged 2-18 years presenting in general practices in the Netherlands were used. Height and weight were measured at baseline, at 6 months, 1 year and 2 year follow-up. Electronic medical files were used to collect information on the frequency and type of consultations at the GP during the two-year follow-up period. Associations between weight status and frequency and type of GP consultations were calculated.

Results

Of the 617 included children, 111 (18%) were overweight or obese and 506 (82%) were non-overweight. Overweight children were significantly older (mean age 9.8 years sd (3.6) versus 7.8 (4.0), p=0.004). Overweight children consulted the GP in general significantly more frequent during the 2-year follow up than non-overweight children (mean 7.3 (5.7) vs 6.7 (5.4), OR 1.09, 95%CI 1.01-1.18). No significant difference was seen in the number of overweight and non-overweight children consulting their GP for musculoskeletal complaints (OR 1.20 (0.86 – 1.68)). Additionally, no significant difference between overweight and non-overweight children was seen for the number of consultations for further specified musculoskeletal disorders.

Conclusion

No association was seen between childhood weight status and the frequency and type of musculoskeletal consultations at the GP during a two year follow-up.

INTRODUCTION

Childhood obesity is a worldwide health issue, especially in western countries (1). Previous studies, mostly carried out on population basis and in secondary healthcare settings, have shown that childhood overweight and obesity are associated with (in questionnaires reported) musculoskeletal complaints, injuries, and fractures as early as childhood (2, 3). The prevalence of musculoskeletal pain is 26% higher in overweight children compared to normal weight children, and the prevalence of injuries and fractures is 8% higher (2). In contrast with these findings, it has also been found that overweight children do not have an increased injury risk compared with normal weight sports participants (4). The mechanisms behind the suggested higher frequency of musculoskeletal complaints and increased risk of injuries and fractures in overweight and obese children is frequently discussed (5). One mechanism is based on altered loading of the joints, causing knee and/or hip pain and related pathologies (6, 7, 8). Altered loading of the joints and excessive weight put on the joints seen in obesity also increases the risk on later life osteoarthritis (OA) (8, 9). Other factors are also thought to play a role in the development of musculoskeletal pain. One of these include disturbed hormone and lipid levels found in overweight and obese adult, and children (10, 11, 12, 13). These are known to play a role in the pathogenesis of osteoarthritis in older adults, but it is unknown whether this mechanism already starts during childhood.

In daily practice, obese children are more likely to present to a pediatric emergency department with injuries and pain of the lower extremities compared to normal-weight children (3, 14). However, in the Netherlands, the general practitioner is the first point of care for non-emergency complaints, as in many other countries. Since previous literature suggests that overweight and obese children report more musculoskeletal problems than normal weight children, the current study will investigate whether these differences influence the frequency of consultations for musculoskeletal complaints at the general practitioner during a follow-up of two years.

METHODS:

Study Design

This study is a prospective longitudinal cohort study using data from the DOERAK cohort. The DOERAK ("Determinants of (sustained) Overweight and complaints; Epidemiological Research among Adolescents and Kids in general practice") cohort was set up to gain knowledge on the differences between overweight and normal-weight children in general practice. The study protocol has previously been published (15). The study has been

approved by the Institutional Review Board of the Erasmus University Medical Center, Erasmus MC.

Participant selection

Between December 2010 and April 2013, children were recruited from 73 general practices. All children visiting their GP or GP-trainee (from here on both defined as GP) in this timeframe were asked to participate in the study. In order to be eligible, children had to be between 2-18 years of age and they/their parents had to have a basic understanding of the Dutch language to be able to give informed consent and fill out Dutch questionnaires. Children having a mental or physical disability, children with co-morbidities affecting weight and children consulting their GP with emergency problems were not eligible to participate.

All children and parents who were approached during consultation received verbal information about the study by their GP during this regular consultation. If child and parent were interested in participation, height, weight and waist circumference of the child were measured and contact information was sent to the researcher. Written study information and informed consent forms were then sent to the participant by the research team (children of age 12 and older also received an informed assent form), where after the researcher contacted the family to answer any questions about the study and to investigate if they were willing to participate. The child was formally included in the study when the informed consent (and informed assent form when needed) was received. While participating in the study, children received usual care from their GP.

Data collection

At baseline, after formal inclusion, a questionnaire was sent to the GP to collect data on the child's height, weight, waist circumference and to collect the reason for consultation at baseline. The parents of the included children also received a questionnaire at baseline to collect data on demographics of parent and child. After inclusion, the participants were asked to fill out a questionnaire at 6, 12 and 24 months. If one of these questionnaires was not completed after one week, a reminder was sent, which was repeated for eight weeks. If after these eight weeks the questionnaire was still unanswered, the research assistant contacted the participant to remind him or her. After two years follow-up, the research assistant retrieved the medical file records of all children who completed the two year follow-up (as covered by informed consent) or who gave permission to search their file even after drop-out. For every consultation during the two year-follow up period, the GP recorded reason for consultation by the international classification of primary care (ICPC-coding) (16) (APPENDIX 1) and the corresponding explanatory text was extracted. Any correspondence between the GP and other health professionals during the two year follow-up was also extracted.

Measures

For the present study, the GP questionnaire was used to extract the child's age and gender. Height and weight were measured by the GP or the research assistant, who received the same instructions and followed an identical protocol (15). From height and weight measures taken after formal inclusion, baseline BMI-z scores were calculated and weight status was determined using the international age and gender specific cut-off points (17, 18). Since only a small percentage of the included children was obese, overweight and obese children were combined into one category called the 'overweight' category. Parent's questionnaires were used to extract general information. Ethnicity (both parents born in the Netherlands, at least one parent born in another country), socio-economic status based on net household income using monthly general labor income of 2014 as cut-off point(19) (<2000 euros/month, ≥2000 euros/month), and marital status reported by parents (parents living together, parents separated) were dichotomized. Highest level of education in the household was categorized into three levels (up to lower secondary level, upper secondary level, at least bachelor level), based on the international standard classification of education (20).

Medical files were used to determine the frequency of all consultations. The ICPC-letter 'L' (corresponding to musculoskeletal complaints) and the explanatory text were used to determine the frequencies of musculoskeletal complaints. To further specify musculoskeletal complaints, the accompanying numbers were used and categorized into lower extremities, upper extremities and others (e.g. back, neck, thorax) (APPENDIX 2). Consultations with code L that could not be categorized, due to missing information on location, were defined as 'unclear'.

Primary outcome measures:

The primary outcome measures of this study were the frequency and type of musculoskeletal consultations during the two year follow-up. Secondary outcomes included the overall number of consultations.

Statistical analyses

Baseline demographics, frequencies of complaints and type of complaints among overweight and non-overweight children were described using means (sd) for continuous variables and frequencies (%) for dichotomous or categorical variables. To test whether weight status was associated with the frequency of musculoskeletal consultations and the frequency of consultations in general, Poisson regression was used. Logistic regression analysis was used to assess the association between weight status and the presence of musculoskeletal consultations during two-year follow-up time. Furthermore, the association between weight status and further specified musculoskeletal conditions denoting to specific body parts were tested separately using logistic regression analysis. Multivari-

able analysis was used to test for different predictors for musculoskeletal consultations during the two-year follow up. Complete case analysis was used.

All analyses were adjusted for potential confounders (age, gender, socio-economic status (ses), marital status), which were considered a confounder if the regression coefficient of the overweight status changed more than 10% after adding it to the model. We did not adjust for ethnicity and education level due to collinearity with ses. P-values <0.05 were considered statistically significant. The strength of associations were determined using Odds Ratios (OR) and Incidence Rate Ratios (IRR) with 95% Confidence Intervals (CI). IBM SPSS statistics 12.0 was used for statistical analyses.

RESULTS

General characteristics

Of the 1109 children that showed interest to their GP to participate, 733 gave written consent and were included. Baseline weight status was missing for 18 children due to missing weight and/or height measures at baseline. At two years follow up, medical records were not searched for 98 children due to drop out and/or no permission. A total of 28 children gave permission to search their medical file after drop-out. Therefore, a total of 617 children were included in the present study (Figure 1). Children excluded from analysis were significantly older (mean age 9.4 years sd (4.4) versus 8.0 (3.9), p=0.001) and had a higher BMI-z at baseline (mean 0.50 (1.3) versus 0.06 (1.344), p=0.003).

At baseline a total of 18% (n = 111) was overweight, of which 24 children (4% of total population) were obese, and 82% (n = 506) was non-overweight (Table 1). Overweight children were significantly older (mean age 9.8 years sd (3.6) versus 7.8 (4.0), p=0.004) and had significantly higher baseline BMI-z values (2.0 (0.7) versus -0.4 (1.1)). Most children came from families with a middle or high SES (78.6%) and high education level (83.5%), with both parents born in the Netherlands (84.8%) and with parents living together (84.0%).

Consultations during 2 year follow up

Overall, there was a mean of 6.8 (5.43) consultations during the 2-year follow up. Overweight children consulted the GP in general significantly more frequent than non-overweight children (mean 7.3 (5.7), and 6.7 (5.4) OR 1.09, 95%CI 1.01-1.18, adjusted p-value 0.03).

A total of 377 (61%) children went to see their GP at least once during follow up, and 260 (42.1%) children went for a musculoskeletal consultation (Table 2). After specifying into the different categories, 164 (26.6%) children consulted their GP for a lower extremity condition, 104 (16.9%) for an upper extremity condition, 65 (10.5%) for other body

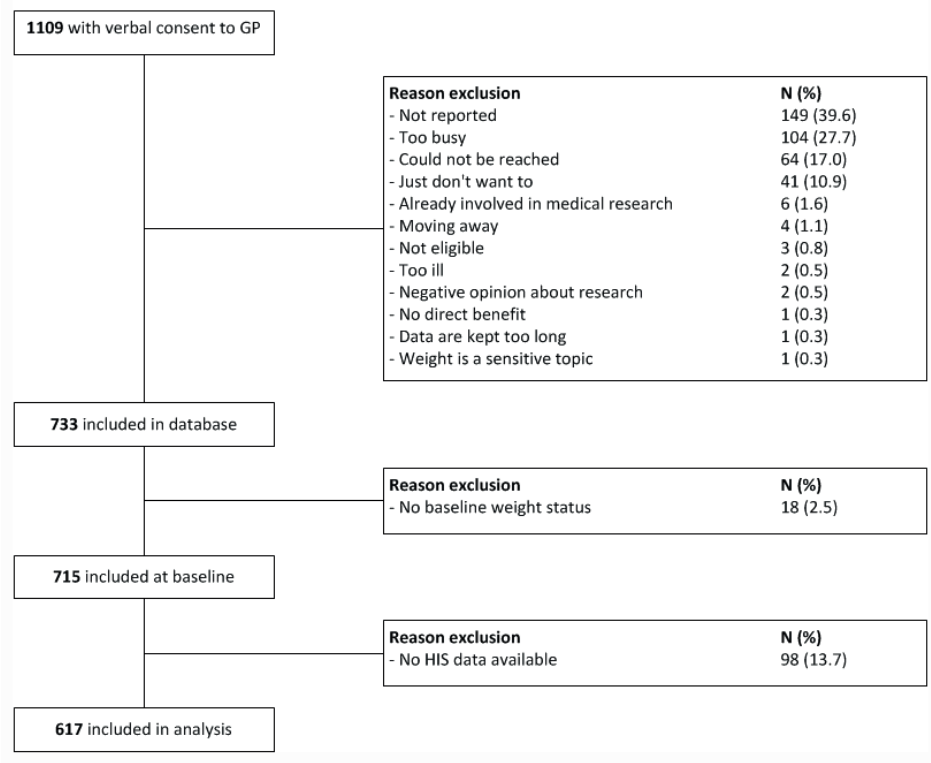

Figure 1 – Flow chart of inclusion

parts and in 42 (6.8%) the musculoskeletal localization was not registered. Since some children visited the GP for multiple musculoskeletal complaints of different categories, the sum of children with further specified consultations is greater than the number of children with consultations in the category 'any musculoskeletal consultation'. No significant difference was seen in the number of overweight and non-overweight children consulting their GP for any musculoskeletal complaints (56 (50.5%) versus 204 (40.3%), OR 1.36 (0.87 – 2.16)). After further specifying the musculoskeletal conditions into consultations for lower extremities, upper extremities, other body part, and miscellaneous, no significant differences in frequencies of visits were seen between children with and without overweight.

Number of musculoskeletal consultations (table 3)

During two-year follow-up, a child had a mean of 0.4 (sd 0.5) musculoskeletal consultations with the GP, which is equal to one musculoskeletal consult per five years. No significant difference was seen in the number of musculoskeletal consultations during two year follow-up between overweight (mean 0.5 (sd 0.5)) and non-overweight (0.4

(0.5)) children (OR 1.20, 95%CI 0.86-1.68). Additionally, no significant difference between overweight and non-overweight children was seen for the number of consultations for any of the further specified musculoskeletal conditions.

Finally, a multivariable regression was performed to test for predictors (besides overweight and/or obesity) for musculoskeletal consultations during two-year follow (Table 4). (Higher) age was significantly associated with a higher number of consultations for musculoskeletal complaints (OR 1.07 (95%C.I. 1.02-1.13).

Table 1 – Baseline characteristics.

	Study population N=617	Normal weight N=506	Overweight/ Obese N=111
Patient characteristics			
	N=617	**N=507**	**N=111**
Gender female, N (%)	321 (52.0)	260 (51.4)	61 (55.0)
	N=617	**N=507**	**N=111**
Age (years), mean (SD)	8.0 (3.9)*	7.76 (3.95)	8.9 (3.6)¤
	N=513	**N=421**	**N=92**
SES	**N (%)**	**N (%)**	**N (%)**
Low (<2000 euros)	110 (21.4)	88 (20.9)	22 (23.9)
Middle/High (>=2000 euros^)	403 (78.6)	333 (79.1)	70 (76.1)
	N=553	**N=450**	**N=103**
Highest education in household	**N (%)**	**N (%)**	**N (%)**
Low (up to lower secondary level)	91 (16.5)	75 (16.7)	16 (15.5)
Middle (upper secondary level)	222 (40.1)	176 (39.1)	46 (44.7)
High (at least bachelor level)	240 (43.4)	199 (44.2)	41 (39.8)
	N=540	**N=441**	**N=99**
Ethnicity	**N (%)**	**N (%)**	**N (%)**
Both parents born in Netherlands	458 (84.8)	379 (85.9)	79 (79.8)
At least one parent born in another country	82 (13.3)	62 (14.1)	20 (20.2)
	N=551	**N=449**	**N=102**
Marital status	**N (%)**	**N (%)**	**N (%)**
Parents separated	88 (16.0)	70 (15.6)	18 (17.6)
Parents together	463 (84.0)	379 (84.4)	84 (82.4)
	N=617	**N=507**	**N=111**
BMI-z score baseline, mean (sd)	0.06 (1.3)*	-0.36 (1.1)	1.98 (0.7) ¤
	N=610	**N=500**	**N=110**
Waist circumference (cm), mean (sd)	60.33 (11.64)*	57.79 (8.76)	71.88 (15.54)¤

^more than 2000 euros monthly net income per household, * significantly different from whole sample (n=733), ¤significantly different from normal weight

Table 2 – Number of patients with musculoskeletal consultations during 2 year follow-up.

	Total (n=617)	OW (n=111)	NW (n=506)	OR (95% C.I.)	Overall p-value	Adjusted OR+ (95% C.I.)	Adjusted p-value+
Any musculoskeletal consultation, # of patients (%)	260 (42.1)	56 (50.5)	204 (40.3)	1.51 (1.00-2.28)	0.05	1.36 (0.86-2.16)	0.19
Lower extremities consultation, # of patients (%)	164 (26.6)	36 (32.4)	128 (25.3)	0.71 (0.45-1.10)	0.12	0.77 (0.46-1.27)	0.30
Upper extremities consultation, # of patients (%)	104 (16.9)	20 (18.0)	84 (16.6)	0.91 (0.53-1.55)	0.72	0.95 (0.52-1.74)	0.88
Other body parts consultation (back, neck), # of patients (%)	65 (10.5)	13 (11.7)	52 (10.3)	0.86 (0.45-1.65)	0.66	0.76 (0.37-1.54)	0.44
Unclear/not registered where complaint is located, # of patients (%)	42 (6.8)	9 (8.1)	33 (6.5)	0.79 (0.37-1.70)	0.55	0.78 (0.32-1.91)	0.59

+adjusted for gender, age, marital status, ses. OW = overweight, NW = normal-weight, OR = odds ratio of overweight status compared to normal-weight

Table 3 – Number of musculoskeletal consultations during 2 year follow-up

	Total (n=617)	OW (n=111)	NW (n=506)	OR (95% C.I.)	Overall p-value	Adjusted OR+ (95% C.I.)	Adjusted p-value+
Any musculoskeletal consultation, mean (sd)	0.4 (0.5)	0.5 (0.5)	0.4 (0.5)	1.25 (0.93 – 1.25)	0.14	1.20 (0.86-1.68)	0.29
Lower extremities consultations, mean (sd)	0.4 (0.8)	0.5 (1.0)	0.4 (0.8)	1.31 (0.97-1.77)	0.08	1.15 (0.82-1.62)	0.43
Upper extremities consultations, mean (sd)	0.3 (0.7)	0.3 (0.8)	0.2 (0.6)	1.21 (0.83-1.78)	0.32	1.11 (0.73-1.69)	0.64
Other body parts consultations (back, neck), mean (sd)	0.1 (0.5)	0.2 (0.6)	0.1 (0.4)	1.31 (0.79-2.19)	0.30	1.22 (0.69-2.15)	0.49
Unclear/not registered where complaint is located, mean (sd)	0.09 (0.4)	0.1 (0.5)	0.08 (0.4)	1.56 (0.85-2.86)	0.15	1.44 (0.72-2.89)	0.30

+adjusted for gender, age, marital status, and ses. OW = overweight, NW = normal-weight, OR = odds ratio of overweight status compared to normal-weight

Table 4 – Multivariable logistic regression for the presence of musculoskeletal consultations during two-year follow up.

	β	OR (95% C.I.)
Age	0.07	1.07 (1.02-1.12)**
Gender (male)	-0.04	0.96 (0.67-1.39)
Ethnicity (both Dutch)	-0.08	0.92 (0.55-1.55)
Marital status (parents together)	-0.03	1.03 (0.59-1.67)
SES (middle/high)	0.03	1.03 (0.62-1.71)
Weight status (normal weight)	-0.25	0.78 (0.49-1.24)

* p<0.05, **p<0.01

DISCUSSION

Main findings

Children with overweight or obesity consulted their GP more often than non-overweight children during a two year follow up period, but not for musculoskeletal problems. When further specifying the musculoskeletal consultations into lower and upper extremities, other body parts and a miscellaneous group, still no significant difference was seen for any of these subgroups in frequency of consultations between overweight and non-overweight children.

Our findings seem to be in contrast with published literature (2, 3, 21) showing more musculoskeletal complaints in overweight and obese children. These complaints were however mainly self-reported by means of questionnaires [8, 10]. These children may report complaints on questionnaires but may not find the complaints serious enough to consult the GP for. This could explain why we found no difference in frequency of musculoskeletal consultations between normal-weight and overweight children. Though, an earlier study performed in primary care did find a difference between overweight and obese children and normal-weight children in experiencing musculoskeletal problems (21). However, the authors did not adjust the analyses for important confounders including socio-economic status and ethnicity, while these factors are known confounders for the frequency of GP consultations (22, 23). This is confirmed by the current study where the positive trend between overweight/obesity and musculoskeletal consultations ($p=0.05$) changes to being not significant ($p=0.19$) after adjusting for confounders (Table 2). Furthermore, our study population is relatively young compared to other literature. It is known that the frequency of musculoskeletal complaints seen in primary care especially increases around the age of ten (24). This is strengthened by the fact that we found a positive association between age and musculoskeletal consultations during follow-up. This might explain that studies with an older age group will find more musculoskeletal complaints.

Strengths and limitations

This is, to our knowledge, the first prospective cohort study comparing overweight and non-overweight children in general practice with a two year follow-up. Calibrated scales were used to measure height and weight for BMI calculation, consultations were recorded from medical files and GP trainees were trained on the reliability of measurement. This all implies that the main outcomes of this paper are based on valid data.

By instructing the GP trainees to invite every child visiting the GP to participate in the study, we tried to minimize selection bias. However, when we compare our study population to the overall Dutch population, parents from children in our cohort were more often both born in the Netherlands (84% vs. 79%) and highly educated (43% vs.

32%). Therefore, our cohort might not be completely representative of all children in general practices, which could lead to an underestimation of the percentage overweight and obese. Furthermore, since we recruited our patients at the GP, our study population only reflects a sample of all children living in the Netherlands. However, since in the current study we are primarily interested in children visiting the GP, we believe this did not impact our results.

Children who completed the two year follow-up or who gave permission for their medical files to be used were included in the analyses. Children excluded from analysis were significantly older and had a higher BMI-z at baseline. Therefore, an underestimation of the percentage overweight could be the result of this selection bias.

The size of our study sample was smaller than intended (15). The smaller sample size may have introduced a power problem. We were able to show a significant difference in visits to the GP in general, indicating that this difference could be even more profound if more children were included.

Furthermore, there was a significant difference in age and BMI between the included and excluded children, which could bias the results. Excluded children were significantly older and had a significantly higher BMI. Since an earlier study found that overweight children of older age had more consultations at the GP than overweight children of younger age (25), the exclusion of these children could have led to an underestimation of the amount of GP consultations.

Finally, we did not take possible changes in weight status during the two year follow up into consideration which may have had impact on the consultations during the 2-year follow-up.

Conclusion

Overweight and obese children visited the GP significantly more often than normal-weight children during a two year follow up. However, no association was seen between childhood overweight and obesity and the frequency and type of musculoskeletal consultations at the GP.

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Appendix 1 - ICPC coding system

ICPC letter	Body system
A	General
B	Blood, blood-forming organs, immunity system
D	Gastro-intestinal
F	Eye
H	Ear
K	Cardiovascular
L	Musculoskeletal
N	Nervous system
P	Psychological problems
R	Airway
S	Skin
T	Endocrine glands, metabolism, nutrution
U	Urinary tract
W	Pregnancy, giving birth
X	Female genitals
Y	Male genitals
Z	Social problems

Appendix 2 – ICPC codes for musculoskeletal complaints

L01 Neck symptom/complain
L02 Back symptom/complaint
L03 Low back symptom/complaint
L04 Chest symptom/complaint
L05 Flank/axilla symptom/complaint
L07 Jaw symptom/complaint
L08 Shoulder symptom/complaint
L09 Arm symptom/complaint
L10 Elbow symptom/complaint
L11 Wrist symptom/complaint
L12 Hand/finger symptom/complaint
L13 Hip symptom/complaint
L14 Leg/thigh symptom/complaint
L15 Knee symptom/complaint
L16 Ankle symptom/complaint
L17 Foot/toe symptom/complaint
L18 Muscle pain
L19 Muscle symptom/complaint NOS
L20 Joint symptom/complaint NOS
L26 Fear of cancer musculoskeletal
L27 Fear musculoskeletal disease other
L28 Limited function/disability (l)
L29 Sympt/complt. Musculoskeletal other
L70 Infections musculoskeletal system
L71 Malignant neoplasm musculoskeletal
L72 Fracture: radius/ulna
L73 Fracture: tibia/fibula
L74 Fracture: hand/foot bone
L75 Fracture: femur
L76 Fracture: other
L77 Sprain/strain of ankle
L78 Sprain/strain of knee
L79 Sprain/strain of joint NOS
L80 Dislocation/subluxation
L81 Injury musculoskeletal NOS
L82 Congenital anomaly musculoskeletal
L83 Neck syndrome
L84 Back syndrome w/o radiating pain
L85 Acquired deformity of spine
L86 Back syndrome with radiating pain
L87 Bursitis/tendinitis/synovitis NOS
L88 Rheumatoid/seropositive arthritis
L89 Osteoarthrosis of hip
L90 Osteoarthrosis of knee
L91 Osteoarthrosis other
L92 Shoulder syndrome
L93 Tennis elbow
L94 Osteochondrosis
L95 Osteoporosis
L96 Acute internal damage knee
L97 Neoplasm benign/unspec musculo.
L98 Acquired deformity of limb
L99 Musculoskeletal disease, other