Serum nonylphenol and obesity in children and adolescents

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Background and objective

◆ **Background:** Experimental models suggest that exposure to low dose nonylphenol could induce adiposity and promote adipocyte differentiation in mice. However, studies on the effect of nonylphenol exposure to human obesity have not been adequately studied.

◆ **Objective:** We investigated the associations of serum nonylphenol concentration with adiposity measures in Korean children and adolescents.
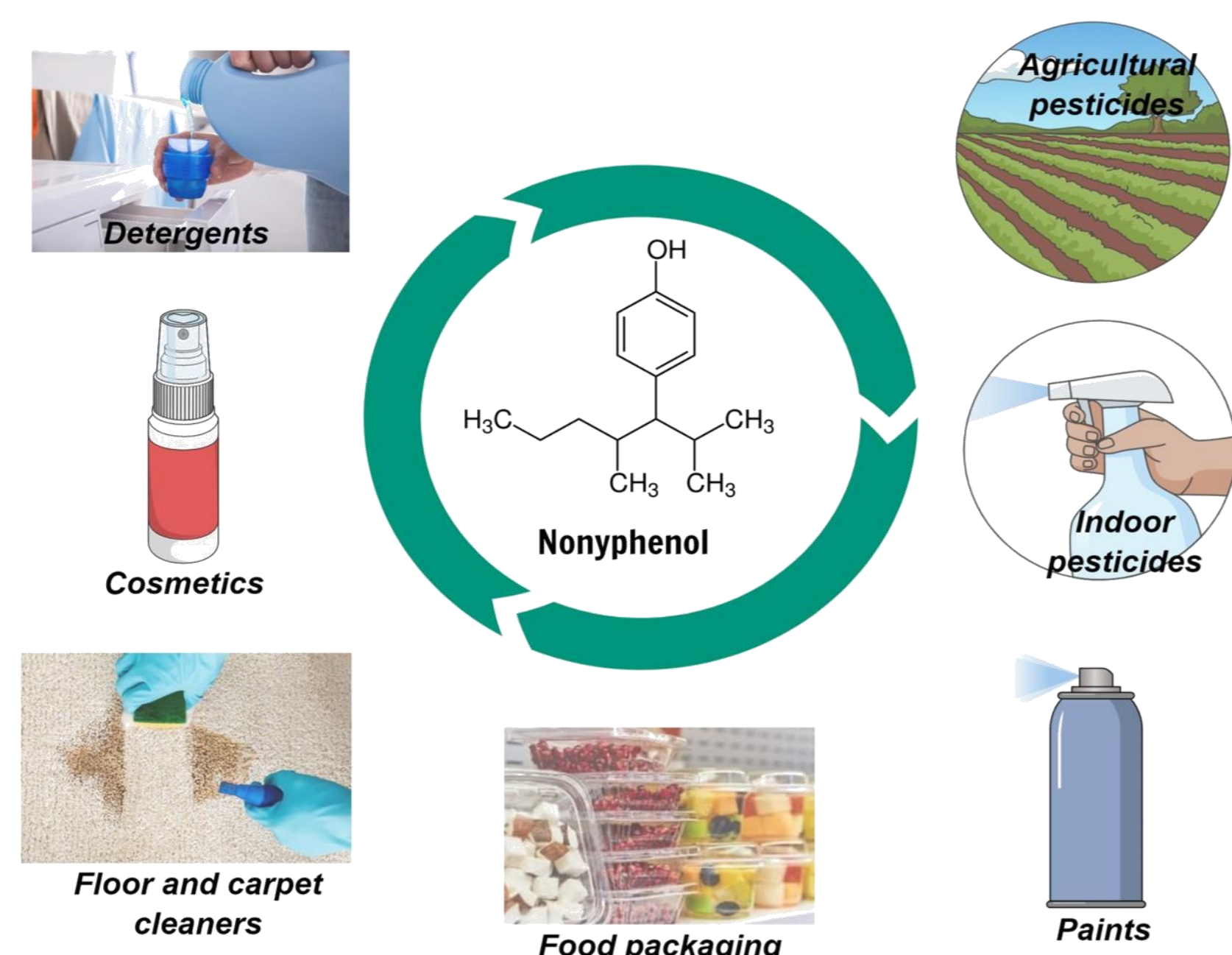

Figure 1. Route of nonylphenol exposure

Methods

◆ A total of 204 children and adolescents, aged 6 to 14 years old (105 overweight-to-obese subjects and 99 controls), were recruited. Anthropometric indices including body mass index (BMI) and body fat mass (kg) were determined. The serum concentrations of nonylphenol were measured using GC-MS SIM mode.
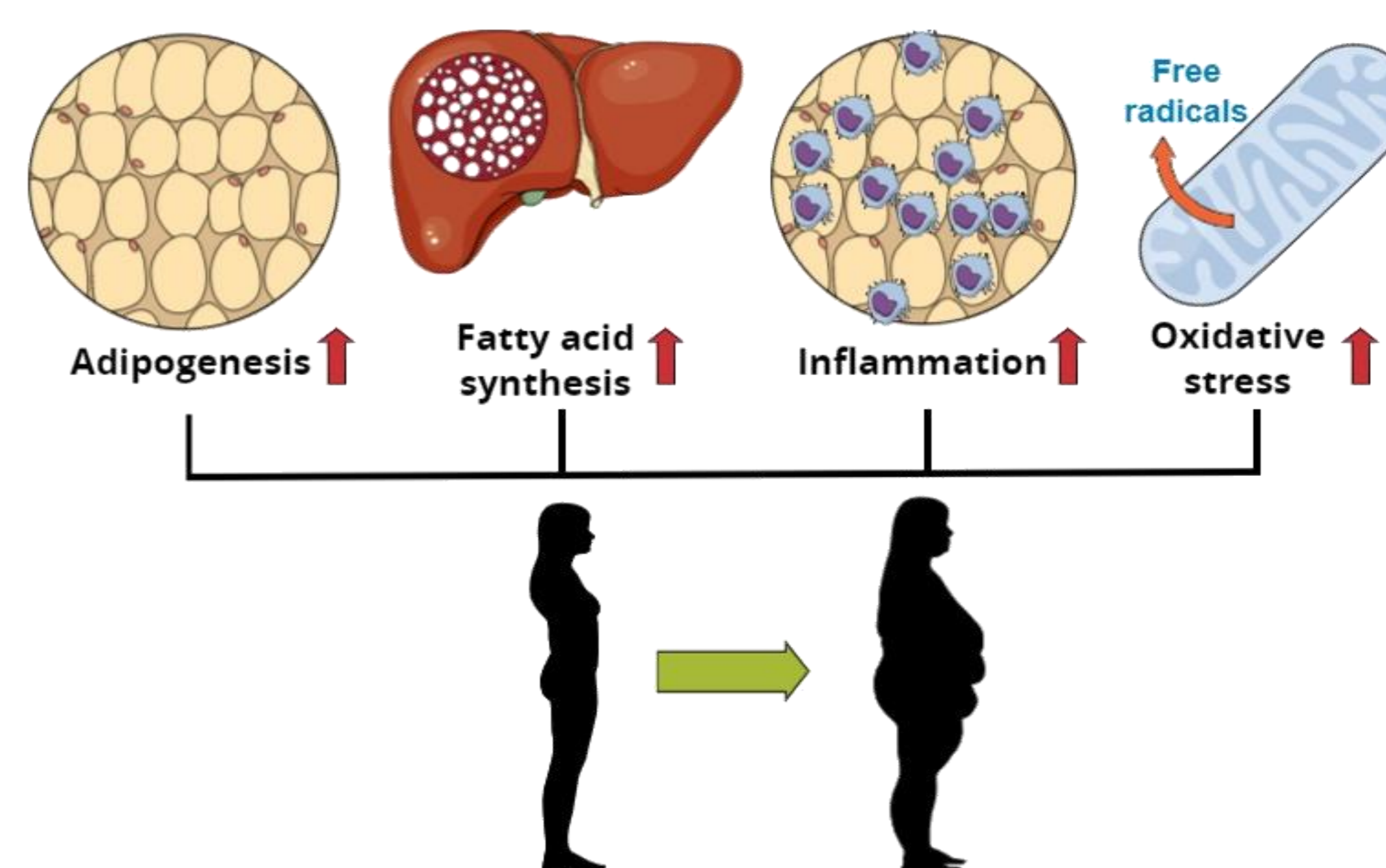

Figure 2. Mechanisms of nonylphenol-induced obesity

Results

Table 1. General characteristics

	Control (n=99)	Overweight (n=105)	P-value
Age (years)	9.3 ± 0.1	8.9 ± 0.2	0.08
Male (n, %)	25 (25.3%)	21 (20%)	0.37
Height (cm)	134.6 ± 0.9	137.5 ± 0.9	0.02
Weight (kg)	30.9 ± 0.6	42.8 ± 1.0	<0.001
Body mass index (kg/m²)	16.9 ± 0.2	22.4 ± 0.2	<0.001
BMI percentile	47.2 ± 2.1	94.8 ± 0.4	<0.001
Body fat mass (kg)	7.1 ± 0.3	15.4 ± 0.5	<0.001
Body fat percent (%)	22.3 ± 0.6	35.4 ± 0.5	<0.001
Gestational age (wk)	39.3 ± 0.2	39.2 ± 0.2	0.99
Birth weight (kg)	3.2 ± 0.4	3.3 ± 0.5	0.32
Physical activity level (n,%)			0.93
M2VPA < 90 min/wk.	40 (40.4%)	40 (38.1%)	
M2VPA 90~149 min/wk.	21 (21.2%)	22 (21.0%)	
M2VPA ≥ 150 min/wk.	38 (38.4%)	43 (41.0%)	
Daily Calorie intake (kcal/day)	1678.5 ± 35.8	1605.1 ± 33.9	0.14
Household income (n, %)			0.37
<300 KRW	14 (14.1%)	22 (21.0%)	
300~599 KRW	61 (61.7%)	63 (60.0%)	
≥600 KRW	24 (24.2%)	20 (19.0%)	

Table 2. Geometric mean and selected percentiles of serum nonylphenol concentrations [ng/mL (95% CI)]

LOD	> LOD(%)	Range	GM (95% CI)	10th	25th	50th	75th	90th
0.3	92.6	LOD~14.22	2.54 (2.26-2.87)	1.06	1.83	3.16	4.49	5.64

Table 3. Adjusted mean (95% confidence intervals) in weight, BMI, and BMI percentile according to the quartiles of nonylphenol

	Q1	Q2	Q3	Q4	P-for-trend
Model 1					
Weight	35.3 (32.8-37.8)	35.5 (32.9-37.9)	37.5 (35.0-39.9)	38.5 (36.0-41.0)	0.038
BMI	19.3 (18.3-20.3)	19.2 (18.2-20.2)	20.2 (19.2-21.1)	20.4 (19.4-21.4)	0.045
BMI percentile	65.4 (57.2-73.6)	67.2 (58.9-75.4)	72.6 (64.5-80.8)	75.1 (66.9-83.1)	0.042
Body fat mass	10.3 (8.5-11.9)	10.1 (8.4-11.8)	11.3 (9.7-13.0)	12.2 (10.6-13.9)	0.048
Model 2					
Weight	35.0 (32.3-37.7)	35.3 (32.5-38.0)	37.7 (35.0-40.4)	38.5 (35.9-41.1)	0.034
BMI	19.2 (18.2-20.3)	19.2 (18.1-20.3)	20.4 (19.3-21.4)	20.4 (19.5-21.5)	0.033
BMI percentile	65.2 (56.5-73.9)	67.3 (58.4-76.1)	75.1 (66.3-83.8)	75.9 (67.5-84.4)	0.030
Body fat mass	10.2 (8.3-12.0)	10.0 (8.1-11.9)	11.69 (9.99-13.5)	12.3 (10.5-14.0)	0.036

Model 1: adjusted for age and sex
Model 2: adjusted for model 1 plus physical activity, calorie intake, household income, gestational age, and birth weight
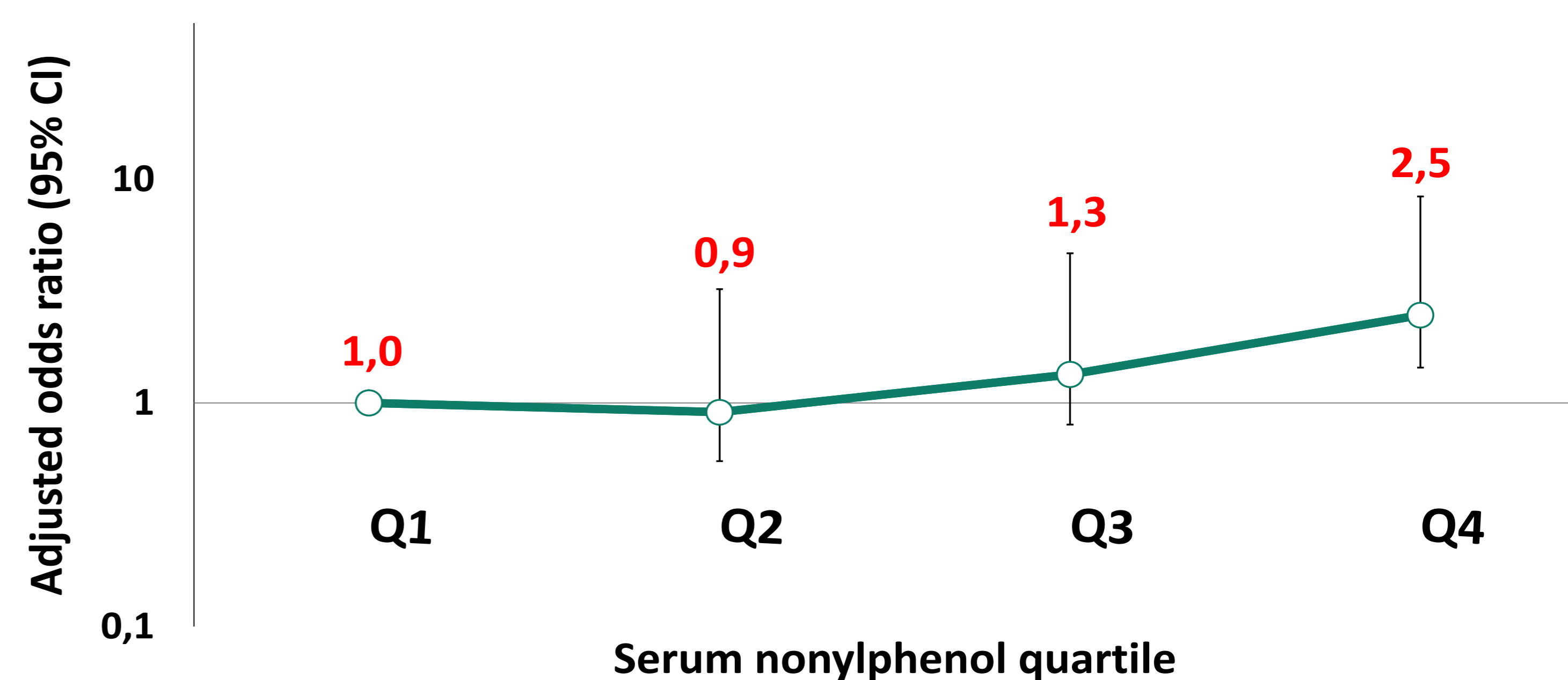

Figure 3. Adjusted odds ratios and 95% confidence intervals for overweight and obesity stratified by serum nonylphenol quartiles

◆ We demonstrated a positive association between serum nonylphenol and obesity in girls. Longitudinal studies with larger sample sizes are needed to confirm our results.