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CARDIOVASCULAR RHYTHMICITY IN OBESE CHILDREN

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Introduction and Objective

Altered circadian (24 hour period length) and ultradian (12h, 8h, 6h, 4.8h period length) blood pressure (BP) and heart rate (HR) rhythmicity have been described in diseases with increased cardiovascular risk. We analyzed cardiovascular rhythmicity in obese children.

Methods

BP and HR rhythmicity was assessed with Fourier analysis from 24-h ambulatory BP measurements in 75 obese children and compared with an age- and gender matched, lean healthy control group of 150 subjects. Circadian and ultradian BP and HR rhythms were further described with amplitude, acrophase and Mesor (Figure 1). Subgroup analysis of non-hypertensive participants was performed. Multivariate regression analysis was applied to identify significant independent factors explaining variability of rhythmicity.

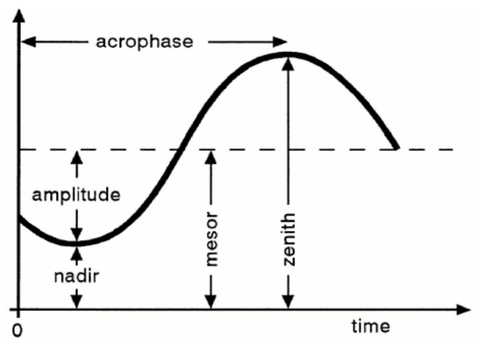

Figure 1: Terminology of rhythmicity

Results

Prevalence of 24-h and 6-h BP rhythmicity in the obese group was lower (p=0.03 and p=0.02), whereas the prevalence of HR rhythmicity was comparable in both groups. Even when excluding hypertensive participants results remained similar with lower prevalence for 24-h and 6-h BP rhythmicity in obese participants (p= 0,02 and p= 0,03).
24-h BP and 24-h HR acrophase were delayed in obese children (p=0.004, p<0.0001), 24-h BP amplitude was comparable (p=0.07), 24-h HR amplitude was blunted (p= < 0.0001). BP Mesor in the obese group was higher (p=0.02), HR Mesor was comparable (p=0.1).
Multivariate regression analysis failed to identify a single responsible anthropometric or blood pressure parameter explaining the variability of BP and HR rhythmicity.

Conclusions

Prevalence and parameters of circadian and ultradian BP and HR rhythmicity in obese children are altered compared to healthy controls and these changes are independent of preexisting hypertension. As children with other underlying cardiovascular disturbances, obese children tend to have blunted amplitudes and delayed acrophases (Table 1).
Interestingly, the number of alterations in obese children are located at the beginning of a spectrum of diseases showing an increasing number of alterations according to the severity of cardiovascular disturbance (Figure 2).

	Saner et al	Wolfenstetter et al	Litwin et al		Wühl et al
	Obese	SGA	WCH	PH	CRF
Prevalence 24 h MAP	▼	=	=	=	▼
Prevalence 12 h MAP	=	=	▲	▲	▲
Prevalence 8 h MAP	=	=	=	=	▲
Prevalence 6 h MAP	=	=			=
Prevalence 24 h HR	=	=	=	=	▼
Prevalence 12 h HR	=	=	=	▼	▲
Prevalence 8 h HR	=	=			=
Prevalence 6 h HR	=	=			=
24-h MAP Amplitude	=	▼	=	▼	▼
12-h MAP Amplitude	=	▼	=	=	▼
8-h MAP Amplitude	=	▼	▼	▼	▼
6-h MAP Amplitude	=	▼	▼	▼	▼
24-h MAP Acrophase	▲	=	▲	▲	▲
12-h MAP Acrophase	=	=	▲	▲	▲
8-h MAP Acrophase	=	=	=	▲	▲
6-h MAP Acrophase	=	=	=	=	▲
24-h HR Amplitude	▼		=	=	▼
12-h HR Amplitude	=	▼	▼	▼	▼
8-h HR Amplitude	=	▼	▼	▼	▼
6-h HR Amplitude	=	▼	=	▼	▼
24-h HR Acrophase	▲	=	▲	▲	▲
12-h HR Acrophase	=	=	▲	▲	=
8-h HR Acrophase	=	=	=	=	▲
6-h HR Acrophase	=	=	▲	▲	▲

Table 1: Rhythmicity pattern in different cardiovascular disturbances

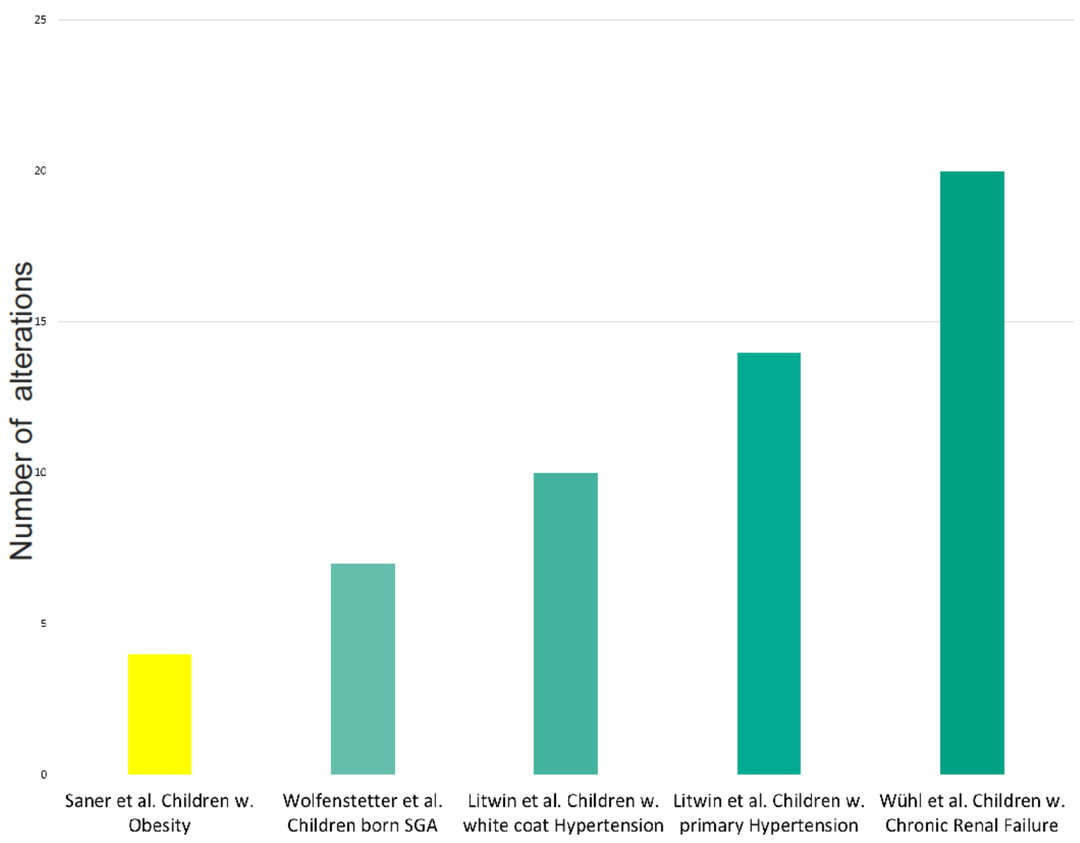

Figure 2: Number of alterations in cardiovascular rhythmicity in different cardiovascular disturbances

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