

Maternal Periconceptional Sleep Quality and Risk of Congenital Heart Disease in Offspring: An Exploratory Case-Control Study

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INTRODUCTION

- ✓ Sleep is essential for maternal health, yet **~15-90% globally and ~49.4% pregnant women in India experience sleep disturbances**.^[1,2]
- ✓ Periconceptional poor sleep quality (PSQ) remains **underestimated**, despite emerging evidences linking it to adverse maternal-perinatal outcomes, including birth defects such as **congenital heart diseases (CHDs)**.^[3]



Figure 1: A Gist of PSQ

- ✓ To date, only **one retrospective study has explored the link between maternal PSQ and CHDs risk**, though relied on a **non-validated sleep assessment tool**.^[4]

OBJECTIVE

To investigate the association between maternal PSQ during periconception and the risk of CHDs in offspring, focusing on key contributing risk factors.

RESULTS & DISCUSSION

Table 1: Participants Characteristics

Factors	Controls	Cases	p ^s
Maternal Age (Y)	25.12±4.17	24.84±4.06	0.34
BMI (Kg/m ²)	22.81±4.56	22.61±4.77	0.49
Economic Status ^[6]	10.88±3.59	11.54±3.69	0.06
PSQI Score	6.76±3.51	8.01±3.09	< 0.01

Values are denoted as Mean ± SD | ^sMann-Whitney U Test
Economic Status Scale: 5-10 (Class IV), 11-15 (Class III)

NS: Non Significant; # 0.05 < p ≤ 0.10 (Trend); * p ≤ 0.05; ** p ≤ 0.01; *** p ≤ 0.001

Figure 3: An Overview of Maternal PSQ

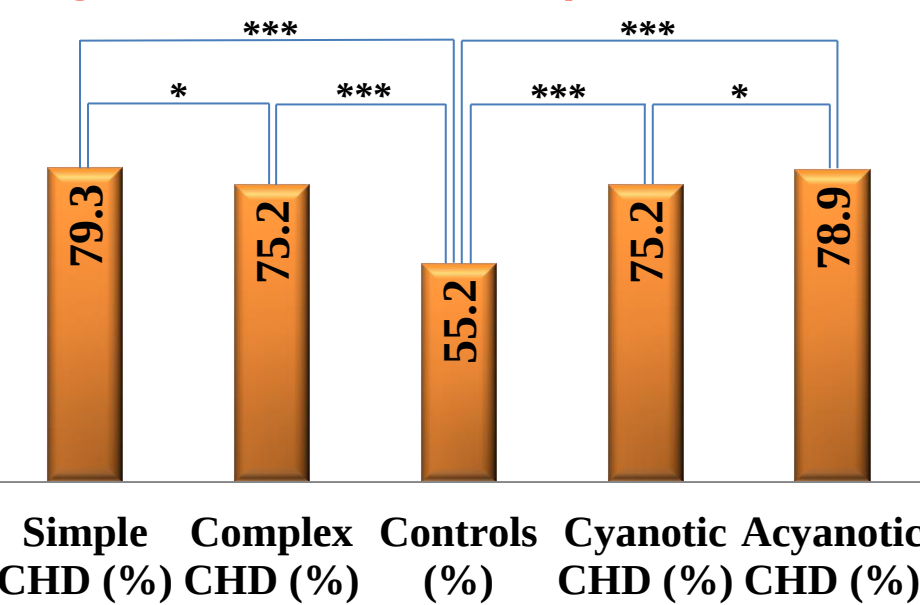
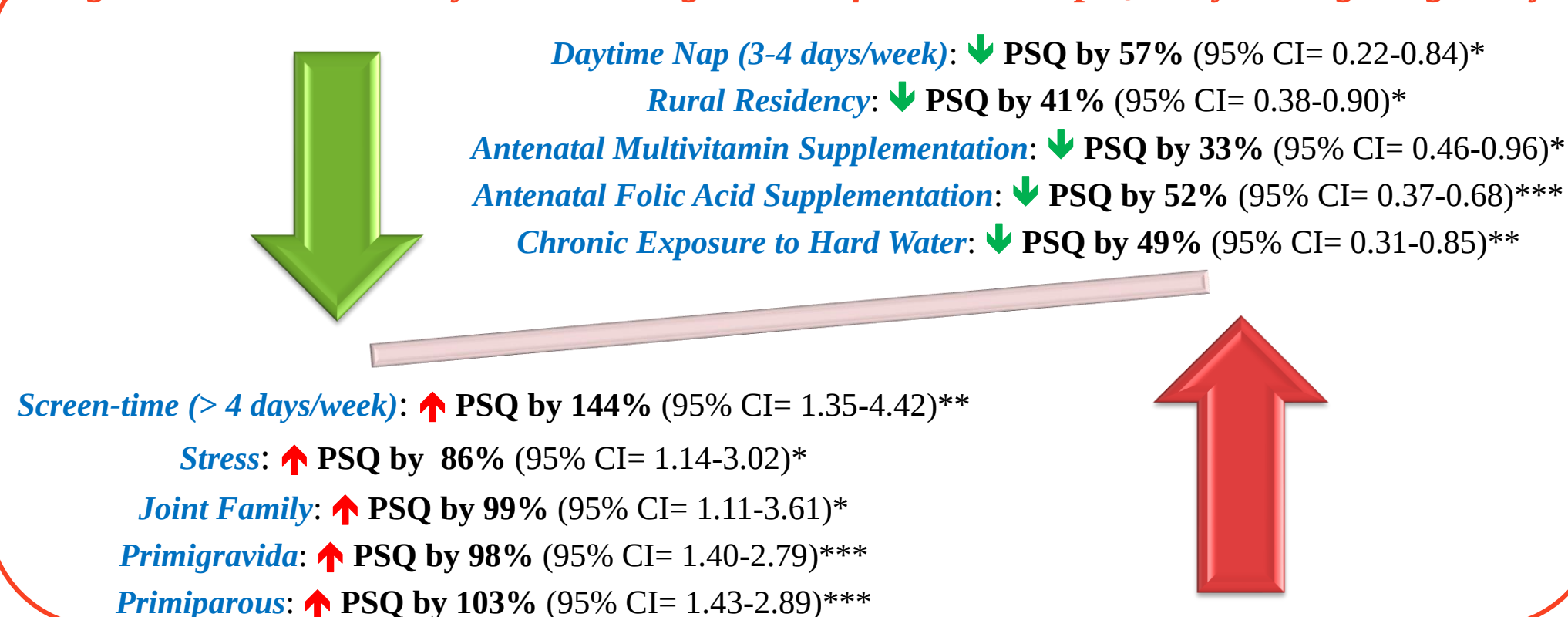


Table 2: Maternal Behavior Correlates Associated with CHD

Factors	Odds Ratio (95% Confidence Intervals)			
	Simple CHD	Complex CHD	Cyanotic CHD	Acyanotic CHD
Caffeine Intake (3-4 d/week)	2.74 (1.64-4.58)***	2.66 (1.56-4.53)***	2.61 (1.51-4.49)***	2.78 (1.68-4.61)***
Caffeine Intake (>4 d/week)	2.96 (1.54-5.68)**	3.75 (1.96-7.16)***	3.55 (1.83-6.88)***	3.17 (1.67-5.99)***
Screen-time (>2 d/week)	2.14 (1.36-3.35)***	1.91 (1.21-3.02)**	1.99 (1.24-3.20)**	2.06 (1.33-3.17)**
Stress	2.07 (1.23-3.49)**	2.09 (1.23-3.56)**	2.12 (1.23-3.65)**	2.05 (1.23-3.43)**

Figure 4: Associated Key Contributing Factors for Poor Sleep Quality during Pregnancy



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METHODOLOGY

- ✓ Design: **Case-Control Observational Study (as per STROBE)**
- ✓ Participants: **Indian mother-infant dyads underwent echocardiography at OPD**
- ✓ Site: **Sri Sathya Sai Sanjeevani Hospital- A free-of-cost tertiary cardiac center**
- ✓ IEC Approved with Informed Consent

Figure 2: Sample Size & Study Design

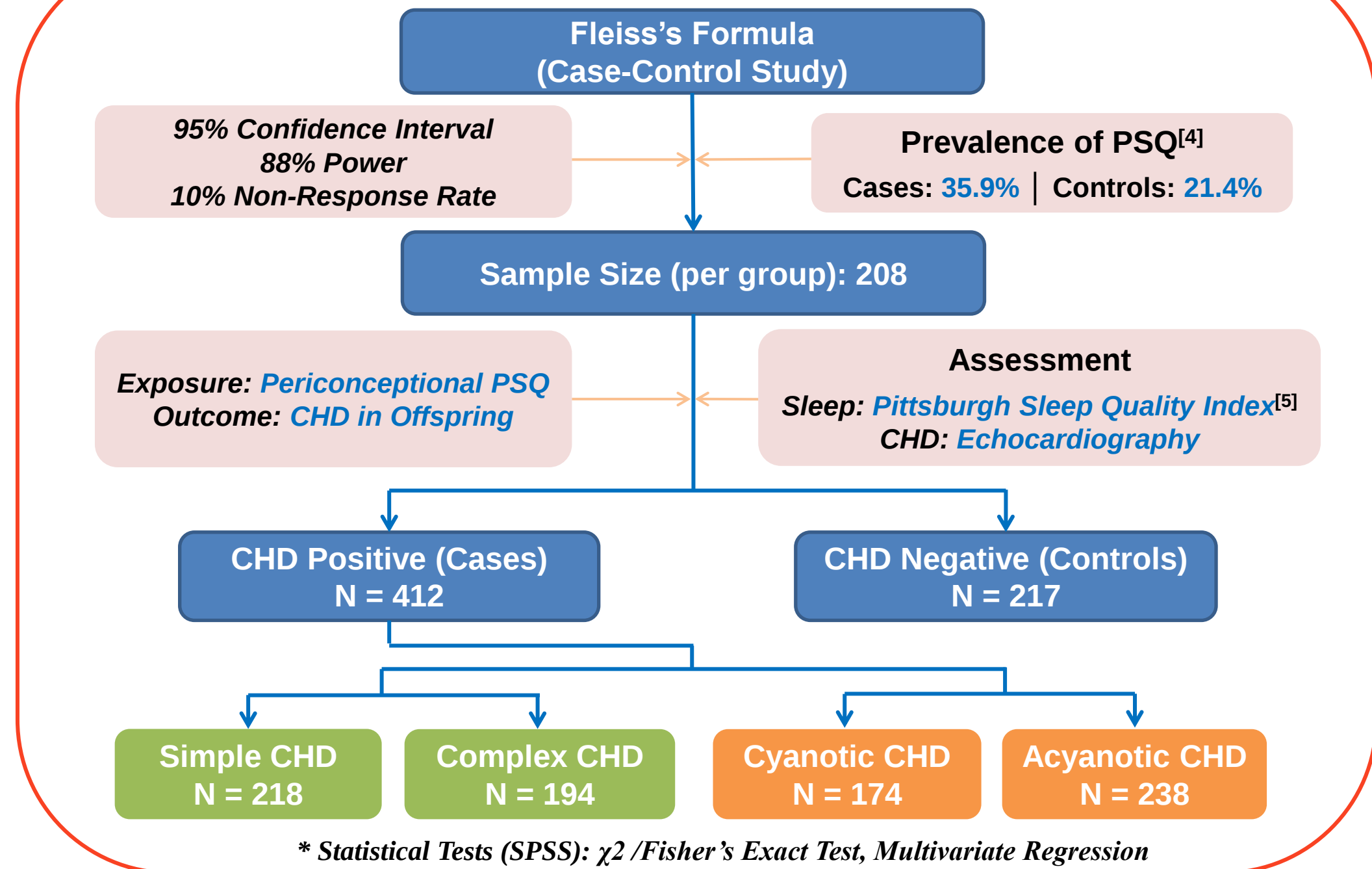


Table 3: Case-Control Association between Maternal PSQ and CHD, and Regression Analysis

Category	Odds Ratio (95 % Confidence Intervals)			
	Simple CHD	Complex CHD	Cyanotic CHD	Acyanotic CHD
Overall PSQ	3.11 (2.04-4.75)***	2.46 (1.61-3.75)***	2.46 (1.59-3.81)***	3.04 (2.02-4.58)***
Subjective Sleep Quality (w.r.t. Good)				
Fairly Bad	1.63 (1.08-2.46)*	NS	NS	1.47 (1.04-2.77)*
Very Bad	2.05 (0.96-4.38)#	NS	NS	NS
Sleep Latency (w.r.t. ≤ 15 min)				
> 15-30 min	1.84 (1.03-3.27)*	3.02 (1.63-5.59)***	3.69 (1.86-7.33)***	1.74 (1.01-3.00)*
> 30-60 min	2.72 (1.44-5.15)**	3.22 (1.61-6.43)***	4.12 (1.94-8.77)***	2.41 (1.31-4.45)**
> 60 min	3.91 (2.15-7.11)***	3.94 (2.04-7.62)***	5.17 (2.51-10.64)***	3.38 (1.90-6.00)***
Sleep Duration (w.r.t. ≥ 7 h)				
6 to < 7 h	NS	1.62 (1.03-2.56)*	1.59 (0.99-2.55)#	1.48 (0.96-2.29)#
5 to < 6 h	1.65 (0.97-2.81)#	NS	NS	NS
< 5 h	NS	NS	NS	NS
Sleep Efficiency (w.r.t. ≥ 85%)				
75 to < 85%	1.48 (0.97-2.26)#	NS	NS	NS
65 to < 75%	NS	NS	NS	NS
< 65%	NS	NS	NS	NS
Sleep Disturbance (w.r.t. < 1x /week)				
1-2x /week	2.00 (1.23-3.24)**	1.69 (1.03-2.81)*	1.73 (1.03-2.89)*	1.95 (1.21-3.14)**
≥ 3x /week	NS	NS	NS	NS
Sleep Medication (w.r.t. < 1x /week)				
1-2x /week	NS	NS	NS	NS
≥ 3x /week	NS	NS	NS	NS
Daytime Dysfunction (w.r.t. < 1x /week)				
1-2x /week	1.67 (1.07-2.62)*	2.81 (1.79-4.43)***	3.03 (1.89-4.84)***	1.66 (1.07-2.57)*
≥ 3x /week	2.05 (1.27-3.29)**	1.85 (1.10-3.12)*	1.97 (1.15-3.38)*	1.96 (1.23-3.13)**
Sleep Position (w.r.t. Left Lateral Sleep Position)				
Right Lateral	2.03 (1.38-2.99)***	1.59 (1.07-2.37)*	1.64 (1.09-2.47)*	1.94 (1.33-2.84)***
Supine	2.68 (0.86-8.29)#	3.23 (1.08-9.66)*	2.98 (0.96-9.26)#	2.93 (0.98-8.75)#

Pittsburgh Sleep Quality Index (PSQI) [Acceptable Internal Consistency (Cronbach's α = 0.79)]
19 Self-Reported Questions | 7 Components | Scoring: 0-21 | Score >5: PSQ

CONCLUSION

- ✓ **First Indian study** demonstrating **~ 2.5 to 3-fold increased odds of CHDs in offspring associated with maternal PSQ**.
- ✓ Prevalence of PSQ is significantly higher among mothers of CHD infants.
- ✓ It underscores the need for routine prenatal sleep assessment & calls for robust prospective studies to elucidate causality and inform targeted preventions.