Contactless Bedside Monitoring Using the Albus Home Research Device (RD) to Predict Severe Asthma Attacks in Children

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RATIONALE: Asthma attacks result in significant morbidity, mortality and health care utilisation (PMID:35252064). Currently, early detection of asthma attacks in children is limited by subjective recognition and reporting of symptoms by the carer or the child. A contactless, bedside device continuously monitoring respiratory parameters at night may support early detection and intervention of worsening asthma symptoms to prevent an attack. We hypothesised that the Albus Home Research Device (RD) (PMID:36478916, 36236241) could be used to detect respiratory symptoms including cough and respiratory rate in children, and significant changes in these symptoms would be detected prior to an asthma attack. METHODS: Children aged 6-16 years with asthma and healthy controls were recruited as part of the ongoing 'Childhood Home Asthma Monitoring Project' (CHAMP) study; a prospective longitudinal observational study evaluating the utility of Albus Home RD in early detection of asthma attacks. Asthmatic children participated in the study for up to 12 months and healthy children for 3 months. Data from children with asthma who reported at least one severe attack was compared to controls monitored over a similar period. RESULTS: Data from 18 children with asthma and 12 healthy children (median age 10 vs 9 years) was analysed. Children with asthma had a total of 35 asthma attacks. Asthmatic children had greater hourly cough frequency during the whole monitoring period than healthy children (Fig.1A; median 3.4 vs 0.7 coughs/hr, Wilcoxon-Mann-Whitney, U=26, p<0.005). Additionally, significant inter-night cough variability (standard deviation) was noted in children with asthma compared to healthy controls (Fig. 1B; median 4.3 vs 1.0 coughs/hr, U=14, p<0.005). There was no significant difference in average nightly respiratory rate (RR) between children with asthma and healthy controls (median 18.2/min vs 16.2/min, U=79, p=0.22). The device detected significant differences in mean nocturnal cough frequency (Fig.1C; paired Wilcoxon-Signed-Rank, Z=-4.47, p<0.005) and inter-night RR variability (Fig. 1D; Z=-2.96, p<0.005) in the week preceding an asthma attack compared to the child's best period by lowest symptom burden. CONCLUSION: Our preliminary data show contactless bedside monitoring with Albus Home RD detected nightly cough and respiratory rate in children passively for several months. Children with asthma exhibited higher cough frequency and variability in respiratory rate in the week preceding a severe asthma attack. The Albus device detected increased respiratory symptoms early, providing a potential therapeutic window to prevent asthma attacks in children.
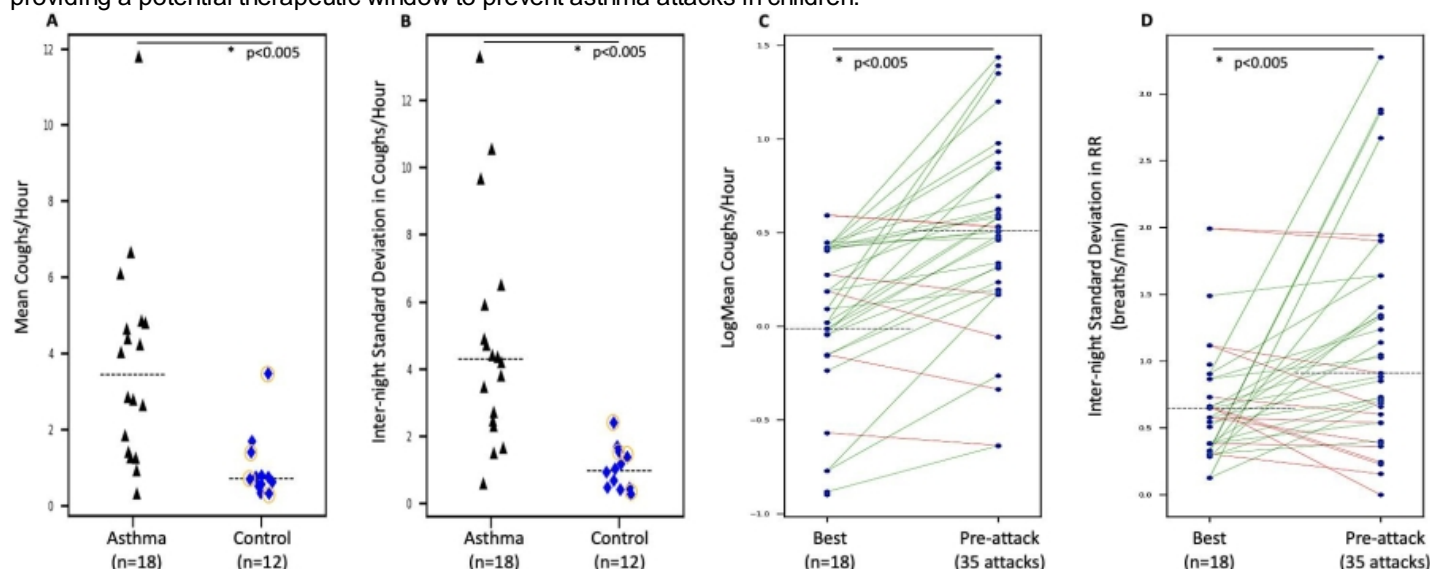
Fig.1. *indicates statistical significance (Wilcoxon-Mann-Whitney for A and B; Wilcoxon-Signed-Rank for C and D); dashed lines show median. A&B) Dot chart comparing mean hourly cough frequency (A) and inter-night variability in hourly cough frequency (B) between asthmatic (n=18) and healthy (n=12) children. Control participant circled if respiratory infection reported during monitoring period. C&D) Connected dot charts for asthma group comparing logMean hourly cough frequency (C) and inter-night variability in mean RR (D) between best period with week preceding attack. Comparison included 35 attacks across 18 children. Green and red connecting lines indicate positive and negative change, respectively.