Abstract

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Fetal heart rate monitoring device using condenser microphone sensor: Validation and comparison to standard devices

BACKGROUND: Fetal heart rate (FHR) monitoring device is highly demanded to assess the fetus health condition in home environments. Conventional standard devices such as ultrasonography and cardiotocography are expensive, bulky and uncomfortable and consequently not suitable for long-term monitoring. Herein, we report a device that can be used to measure fetal heart rate in clinical and home environments. METHODS: The proposed device measures and displays the FHR on a screen liquid crystal display (LCD). The device consists of hardware that comprises condenser microphone sensor, signal conditioning, microcontroller and LCD, and software that involves the algorithm used for processing the conditioned fetal heart signal prior to FHR display. The device’s performance is validated based on analysis of variance (ANOVA) test. RESULTS: FHR data was recorded from 22 pregnant women during the 17th to 37th week of gestation using the developed device and two standard devices AngelSounds and Electronic Stethoscope. The results show that F-value (1.5) is less than Fcrit, (3.1) and p-value (p$>$ 0.05). Accordingly, there is no significant difference between the mean readings of the developed and existing devices. Hence, the developed device can be used for monitoring FHR in clinical and home environments.