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Calculation Of Fetal Weight Estimation Using TFT Displayed Nadhia Regitasari#, M. Ridha Mak'ruf, Endang Dian Setioningsih Department of Electromedical Engineering Poltekkes Kemenkes, Surabaya Jl. Pucang Jajar Timur No. 10, Surabaya, 60245, Indonesia #nadregita @gmail.com, m.reedha @gmail.com, diancholik @gmail.com, Article info: Received May 24, 2019; Revised July 4, 2019; Accepted January 6, 2020 Abstract— Fetal weight estimation during pregnancy is one of the beneficial ways to solve morbidity and death during labor problems. Manually, the fundal height is measured from the edge of the pubic symphysis to the top of the uterine fundus by following the arch of the uterus, using a measuring tape. The purpose of this study is to develop an easy way to count fetal weight estimation so midwives don't have to count manually. The calculation of the fetal weight estimation tool uses a variable resistor (potentiometer) as a sensor to measure the fundal height. Then it will be processed in the microcontroller. The measurement results are fundal height and estimation of fetal weight that will be displayed on the TFT LCD. Based on the results of measuring the fundus uterine height as much as 6 times against the measuring tool (ruler), there is no error in the device so it can be concluded that this tool can be used according to its function. This calculation of fetal weight estimation tool is portable and easy to use to help midwives count the fetal weight estimation quickly. Keywords—Estimation Fetal Weight; Fundal Height; Pubic Symphysis. I. INTRODUCTION Perinatal mortality in infants with low birth weight and pain due to large birth weight is a problem in perinatal health and labor management. According to the Indonesian Demographic and Health Survey in 2012, infant mortality in Indonesia decreased slightly to 32 per 1000 live births from 34 per 1,000 live births in 2007. A very slow decline, while the target that has to be achieved according to the Millennium Development Agreement Goals (MDGs) in 2015 is 24 per 1000 live births[1]. Fetal Weight Estimation during pregnancy is one of the beneficial ways to overcome the problem of morbidity and death during labor. Birth weight will affect the accuracy of labor and the results so that it is expected to reduce mortality and morbidity in mothers. The fetal weight estimation technique that is most often performed by midwives is by measuring fundal uterine height. Measuring the height of the uterine fundus is precisely done on a centimeter scale. Fundal uterine height has a strong and significant relationship with the baby's weight and reflects fetal growth and more accurate fetal size[2]. There are several formulas to find out the estimated birth weight of the baby, including the Johnson Tohsach formula. Johnson Tohsach's formula uses a method to estimate fetal weight by measuring fundal uterine height, which measures the distance between the edges of the pubic symphysis to the top of the uterine fundus by following the uterine arch, using a measuring tape and checking the vaginal taucher to find out the lowest decrease[3]. Usually, the calculation of the fetal weight estimation formula is done manually. Based on these problems, then the author will make "Calculation of Fetal Weight Estimation displayed with TFT LCD" tool. This module can be used to calculate the fetal weight estimation quickly and practically. II. MATERIALS AND METHODS A. Experimental Setup This study used five pregnant women with a pregnancy age above 5 months who are not obese with the condition of a non- twin fetus, not breech, not transverse, and not experiencing amniotic abnormalities. The subjects were randomly sampled and the data collection is repeated 3 times. 1) Materials and Tool This study is used a measuring tape to measure fundal height from top of the uterus to the pubic symphysis. The Arduino Nano microcontroller was used to convert ADC data from potentiometer to length that displayed to TFT LCD. A digital multimeter was used to measure the resistance and

voltage of the potentiometer. 2) Experiment In this study, after the design was completed then the length value (cm) on display was matched with a ruler with 1 cm resolution. And the fetal weight estimation was counted manually. Then this module was tested on pregnant women. B. The Diagram Block The potentiometer will read the fundal height of the uterus of the pregnant woman. The Yes and No buttons on the TFT LCD are used to input the location of the fetal head (it have Journal of Electronics, Electromedical, and Medical Informatics (JEEEMI) 19 entered to the pelvic inlet or not). After selecting the location of the fetal head, the microcontroller will process all these commands and provide data information to the TFT LCD so it can display the fundal height and fetal weight estimation. To repeat from the beginning, a reset button is used. Fig. 3. Height detector circuit Fig. 1. The diagram block of the Modul This module uses a potentiometer as a sensor of fundal height that connected to measuring tape. This potentiometer's value is 10KΩ which can rotate 10 times. The resistance from the potentiometer will be connected to Arduino Nano in pin A0. The microcontroller will convert ADC data from the potentiometer to the length that displayed to TFT LCD. III. RESULTS In this study, this module is matched with a ruler with a resolution one cm. And the fetal weight estimation was counted manually using the Johnson Tohsach formula. Fig. 4. The Calculation of Fetal Weight Estimation Design Fig. 2. The Flowchart of the Arduino Program 1) The Calculation of Fetal Weight Estimation Design C. The Flowchart The photograph of the calculation of fetal weight estimation The Arduino program was built based on the flowchart as design was shown in Fig. 4. The input of this module is from shown in Fig. 2. After the initialization of the Arduino, then measuring tape that was connected to a potentiometer (10k Ω). we select the location of the fetal head with YES or NO button There was 3 connectors from the potentiometer. That was on TFT LCD. After that, we can measure the fundal height connected to Vcc, ground, and A0 port in Arduino Nano using this module and the TFT LCD will display the fundal microcontroller which is the main board of this module. The height and fetal weight estimation. To go back to the selection ADC data will be processed so the fundal height and fetal of fetal head, we can press the RESET button. weight estimation can be displayed in TFT LCD. D. The Fundal Height Detector Circuit 2) The Listing Program for Arduino This program is used to detect fundal height from The important part of this development is the fundal height potentiometer and display to TFT LCD. It will be explained detector circuit describes in Fig. 3 below. void loop() if (page == 4) { { adc=analogRead(A0); Serial.print("n0.val="); jumlah=jumlah+adc; Serial.print(TFU); ke++; Serial.write(0xff); delay(10); Serial.write(0xff); if (ke>25) Serial.write(0xff); { Serial.print(" n1.val="); ke =0; Serial.write(0xff); rata = jumlah/25; Serial.write(0xff); { Serial.write(0xff); ke=0; } rata = jumlah/25; if (page == 4) jumlah=0; { panjang=rata*0.114503817; Serial.print("n0.val="); if (panjang<=3) Serial.print(TFU); { Serial.write(0xff); TFU=0; Serial.write(0xff); } Serial.write(0xff); else Serial.print("n1.val="); { Serial.print(NPAP); TFU=panjang-3; Serial.write(0xff); } Serial.write(0xff); if (TFU<=11) Serial.write(0xff); { } YPAP=0; } } nexLoop(nex_listen_list); else } { YPAP = (TFU-11)*155; } The height of Fundus Uteri is read by pin A0. It reads ADC if (TFU<=12) data 25 times and then divided. After that the data will be { proccessed by mocrocontroller and displayed on TFT LCD. NPAP=0; 1. Adc = analogRead (A0), is a program that reads } else ADC0 data from input sensors, namely { potentiometers. NPAP = (TFU-12)*155; 2. Panjang = rata * 0.114503817; is the convertion } program from ADC to length. 3. Because there is a mechanical addition of 3 cm, the if (page == 3) length is reduced by 3 cm. { Serial.print("n0.val="); 4. When the YES button is pressed, then the formula = Serial.print(TFU); (TFU-11) x 155. When the NO button is pressed, Serial.write(0xff); then the formula = (TFU-12) x 155

Serial.write(0xff); 5. TFU and TBJ when the head of the fetus has entered Serial.write(0xff); the top of the pelvis will be displayed on page 3 Serial.print("n1.val="); nextion at n.0 and n.1. TFU and TBJ when the head Serial.print(YPAP); of the fetus has not entered the upper pelvic door will Serial.write(0xff); Serial.write(0xff); be displayed on page 4 nextion at n.0 and n.1. Serial.write(0xff); } 3) The Error of fundal height value The validation of the fundal height value shown in the TFT LCD. The error was showed in Table I. TABLE I. THE ERROR OF MEASUREMENT FOR FUNDAL HEIGHT PARAMETER BETWEEN THE DESIGN AND RULER. H(ecimgh)t % Error H(ecimgh)t % Error H(ecimgh)t % Error 11 0% 21 0% 31 0% 12 0% 22 0% 32 0% 13 0% 23 0% 33 0% 14 0% 24 0% 34 0% 15 0% 25 0% 35 0% 0% 26 0% 36 0% 0% 27 0% 37 0% 0% 28 0% 38 0% 16 17 18 19 0% 29 0% 39 0% 20 0% 30 0% 40 0% TABLE II. THE ERROR OF MEASUREMENT FOR THE FUNDAL HEIGTH PARAMETER BETWEEN THE DESIGN AND MEASURING TAPE ON SUBJECT Subject Fundal Height (cm) % Error P1 29 0% P2 20 1,5% P3 28 0% P4 27 1,1% P5 29 0% The measurement of fundal height value using the module is compared with measuring tape on the subject. The result was shown in Table 2. IV. DISCUSSION The calculation of the fetal weight estimation module has been examined and test completely in this study. Based on the measurement of the module output with a ruler as a measuring instrument, it shows the right value of fundal height and fetal weight estimation with no error. This is indicated that this module is feasible to be used as a medical device. By comparing the output of the module with measuring tape on the subject, it was shown that there is an error. The biggest error is 1,5% and the lowest error is 0%. This is reasonable because it depends on the user that determines the fundal height point. V. CONCLUSION This study has demonstrated the development of the module to measure the fundal height and calculate the fetal weight estimation a subject in real-time. This study was built based on an Arduino microcontroller. This study has proofed that accuracy is feasible to be used. In the future, this study can be used by midwives to calculate the fetal weight estimation quickly and practically. REFERENCES [1] S. Widatiningsih and Dkk, "Accuracy of Johnson ' s Birth Weight Estimation on Pregnant Women at Third Trimester in the Area of Pare Public Health Center Temanggung District Akurasi Penaksiran Berat Janin menggunakan Metode Johnson pada Ibu Hamil Trimester III di Wilayah Kerja Puske," vol. 4, no. 2, pp. 743–747, 2015. [2] E. Rianti and Dkk, "Deviasi Taksiran Berat Janin pada," vol. VIII, pp. 235–239, 2017. [3] Mardeyanti and Dkk, "Ketepatan taksiran berat badan janin dibandingkan dengan berat badan bayi baru lahir," vol. 1, pp. 12– 17, 2013. Journal of Electronics, Electromedical, and Medical Informatics (JEEEMI) Vol. 2, No. 1, January 2020, pp. 19-22 DOI: 10.35882/jeeemi. v2i1.4 ISSN:2656-8632 Journal of Electronics, Electromedical, and Medical Informatics (JEEEMI) Vol. 2, No. 1, January 2020, pp. 19-22 DOI: 10.35882/jeeemi. v2i1.4 ISSN:2656-8632 Journal of Electronics, Electromedical, and Medical Informatics (JEEEMI) Vol. 2, No. 1, January 2020, pp. 19-22 DOI: 10.35882/jeeemi. v2i1.4 ISSN:2656-8632 Journal of Electronics, Electromedical, and Medical Informatics (JEEEMI) Vol. 2, No. 1, January 2020, pp. 19-22 DOI: 10.35882/jeeemi. v2i1.4 ISSN:2656-8632