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ЕЖЕМЕСЯЧНЫЙ НАУЧНЫЙ ЖУРНАЛ

Медицинские новости Грузии

საქართველოს სამედიცინო სიახლენი

GEORGIAN MEDICAL NEWS

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GMN: Georgian Medical News is peer-reviewed, published monthly journal committed to promoting the science and art of medicine and the betterment of public health, published by the GMN Editorial Board since 1994. GMN carries original scientific articles on medicine, biology and pharmacy, which are of experimental, theoretical and practical character; publishes original research, reviews, commentaries, editorials, essays, medical news, and correspondence in English and Russian.

GMN is indexed in MEDLINE, SCOPUS, PubMed and VINITI Russian Academy of Sciences. The full text content is available through EBSCO databases.

GMN: Медицинские новости Грузии - ежемесячный рецензируемый научный журнал, издаётся Редакционной коллегией с 1994 года на русском и английском языках в целях поддержки медицинской науки и улучшения здравоохранения. В журнале публикуются оригинальные научные статьи в области медицины, биологии и фармации, статьи обзорного характера, научные сообщения, новости медицины и здравоохранения. Журнал индексируется в MEDLINE, отражён в базе данных SCOPUS, PubMed и ВИНИТИ РАН. Полнотекстовые статьи журнала доступны через БД EBSCO.

GMN: Georgian Medical News – საქართველოს სამედიცინო სიახლენი – არის ყოველთვიური სამეცნიერო სამედიცინო რეცენზირებადი ჟურნალი, გამოიცემა 1994 წლიდან, წარმოადგენს სარედაქციო კოლეგიისა და აშშ-ის მეცნიერების, განათლების, ინდუსტრიის, ხელოვნებისა და ბუნებისმეტყველების საერთაშორისო აკადემიის ერთობლივ გამოცემას. GMN-ში რუსულ და ინგლისურ ენებზე ქვეყნდება ექსპერიმენტული, თეორიული და პრაქტიკული ხასიათის ორიგინალური სამეცნიერო სტატიები მედიცინის, ბიოლოგიისა და ფარმაციის სფეროში, მიმოხილვითი ხასიათის სტატიები.

ჟურნალი ინდექსირებულია MEDLINE-ის საერთაშორისო სისტემაში, ასახულია SCOPUS-ის, PubMed-ის და ВИНИТИ РАН-ის მონაცემთა ბაზებში. სტატიების სრული ტექსტი ხელმისაწვდომია EBSCO-ს მონაცემთა ბაზებიდან.

WEBSITE

www.geomednews.com

К СВЕДЕНИЮ АВТОРОВ!

При направлении статьи в редакцию необходимо соблюдать следующие правила:

1. Статья должна быть представлена в двух экземплярах, на русском или английском языках, напечатанная через **полтора интервала на одной стороне стандартного листа с шириной левого поля в три сантиметра**. Используемый компьютерный шрифт для текста на русском и английском языках - **Times New Roman** (**Кириллица**), для текста на грузинском языке следует использовать **AcadNusx.** Размер шрифта - **12**. К рукописи, напечатанной на компьютере, должен быть приложен CD со статьей.

2. Размер статьи должен быть не менее десяти и не более двадцати страниц машинописи, включая указатель литературы и резюме на английском, русском и грузинском языках.

3. В статье должны быть освещены актуальность данного материала, методы и результаты исследования и их обсуждение.

При представлении в печать научных экспериментальных работ авторы должны указывать вид и количество экспериментальных животных, применявшиеся методы обезболивания и усыпления (в ходе острых опытов).

4. К статье должны быть приложены краткое (на полстраницы) резюме на английском, русском и грузинском языках (включающее следующие разделы: цель исследования, материал и методы, результаты и заключение) и список ключевых слов (key words).

5. Таблицы необходимо представлять в печатной форме. Фотокопии не принимаются. **Все цифровые, итоговые и процентные данные в таблицах должны соответствовать таковым в тексте статьи**. Таблицы и графики должны быть озаглавлены.

6. Фотографии должны быть контрастными, фотокопии с рентгенограмм - в позитивном изображении. Рисунки, чертежи и диаграммы следует озаглавить, пронумеровать и вставить в соответствующее место текста **в tiff формате**.

В подписях к микрофотографиям следует указывать степень увеличения через окуляр или объектив и метод окраски или импрегнации срезов.

7. Фамилии отечественных авторов приводятся в оригинальной транскрипции.

8. При оформлении и направлении статей в журнал МНГ просим авторов соблюдать правила, изложенные в «Единых требованиях к рукописям, представляемым в биомедицинские журналы», принятых Международным комитетом редакторов медицинских журналов - http://www.spinesurgery.ru/files/publish.pdf и http://www.nlm.nih.gov/bsd/uniform_requirements.html
В конце каждой оригинальной статьи приводится библиографический список. В список литературы включаются все материалы, на которые имеются ссылки в тексте. Список составляется в алфавитном порядке и нумеруется. Литературный источник приводится на языке оригинала. В списке литературы сначала приводятся работы, написанные знаками грузинского алфавита, затем кириллицей и латиницей. Ссылки на цитируемые работы в тексте статьи даются в квадратных скобках в виде номера, соответствующего номеру данной работы в списке литературы. Большинство цитированных источников должны быть за последние 5-7 лет.

9. Для получения права на публикацию статья должна иметь от руководителя работы или учреждения визу и сопроводительное отношение, написанные или напечатанные на бланке и заверенные подписью и печатью.

10. В конце статьи должны быть подписи всех авторов, полностью приведены их фамилии, имена и отчества, указаны служебный и домашний номера телефонов и адреса или иные координаты. Количество авторов (соавторов) не должно превышать пяти человек.

11. Редакция оставляет за собой право сокращать и исправлять статьи. Корректура авторам не высылается, вся работа и сверка проводится по авторскому оригиналу.

12. Недопустимо направление в редакцию работ, представленных к печати в иных издательствах или опубликованных в других изданиях.

При нарушении указанных правил статьи не рассматриваются.

REQUIREMENTS

Please note, materials submitted to the Editorial Office Staff are supposed to meet the following requirements:

1. Articles must be provided with a double copy, in English or Russian languages and typed or compu-ter-printed on a single side of standard typing paper, with the left margin of **3** centimeters width, and **1.5** spacing between the lines, typeface - **Times New Roman** (**Cyrillic**), print size - **12** (referring to Georgian and Russian materials). With computer-printed texts please enclose a CD carrying the same file titled with Latin symbols.

2. Size of the article, including index and resume in English, Russian and Georgian languages must be at least 10 pages and not exceed the limit of 20 pages of typed or computer-printed text.

3. Submitted material must include a coverage of a topical subject, research methods, results, and review.

Authors of the scientific-research works must indicate the number of experimental biological species drawn in, list the employed methods of anesthetization and soporific means used during acute tests.

4. Articles must have a short (half page) abstract in English, Russian and Georgian (including the following sections: aim of study, material and methods, results and conclusions) and a list of key words.

5. Tables must be presented in an original typed or computer-printed form, instead of a photocopied version. **Numbers, totals, percentile data on the tables must coincide with those in the texts of the articles.** Tables and graphs must be headed.

6. Photographs are required to be contrasted and must be submitted with doubles. Please number each photograph with a pencil on its back, indicate author's name, title of the article (short version), and mark out its top and bottom parts. Drawings must be accurate, drafts and diagrams drawn in Indian ink (or black ink). Photocopies of the X-ray photographs must be presented in a positive image in **tiff format**.

Accurately numbered subtitles for each illustration must be listed on a separate sheet of paper. In the subtitles for the microphotographs please indicate the ocular and objective lens magnification power, method of coloring or impregnation of the microscopic sections (preparations).

7. Please indicate last names, first and middle initials of the native authors, present names and initials of the foreign authors in the transcription of the original language, enclose in parenthesis corresponding number under which the author is listed in the reference materials.

8. Please follow guidance offered to authors by The International Committee of Medical Journal Editors guidance in its Uniform Requirements for Manuscripts Submitted to Biomedical Journals publication available online at: http://www.nlm.nih.gov/bsd/uniform_requirements.html
http://www.icmje.org/urm_full.pdf
In GMN style for each work cited in the text, a bibliographic reference is given, and this is located at the end of the article under the title "References". All references cited in the text must be listed. The list of references should be arranged alphabetically and then numbered. References are numbered in the text [numbers in square brackets] and in the reference list and numbers are repeated throughout the text as needed. The bibliographic description is given in the language of publication (citations in Georgian script are followed by Cyrillic and Latin).

9. To obtain the rights of publication articles must be accompanied by a visa from the project instructor or the establishment, where the work has been performed, and a reference letter, both written or typed on a special signed form, certified by a stamp or a seal.

10. Articles must be signed by all of the authors at the end, and they must be provided with a list of full names, office and home phone numbers and addresses or other non-office locations where the authors could be reached. The number of the authors (co-authors) must not exceed the limit of 5 people.

11. Editorial Staff reserves the rights to cut down in size and correct the articles. Proof-sheets are not sent out to the authors. The entire editorial and collation work is performed according to the author's original text.

12. Sending in the works that have already been assigned to the press by other Editorial Staffs or have been printed by other publishers is not permissible.

Articles that Fail to Meet the Aforementioned Requirements are not Assigned to be Reviewed.

ავტორთა საყურადღებოდ!

რედაქციაში სტატიის წარმოდგენისას საჭიროა დავიცვათ შემდეგი წესები:

1. სტატია უნდა წარმოადგინოთ 2 ცალად, რუსულ ან ინგლისურ ენებზე,დაბეჭდილი სტანდარტული ფურცლის 1 გვერდზე, 3 სმ სიგანის მარცხენა ველისა და სტრიქონებს შორის 1,5 ინტერვალის დაცვით. გამოყენებული კომპიუტერული შრიფტი რუსულ და ინგლისურენოვან ტექსტებში - **Times New Roman (Кириллица)**, ხოლო ქართულენოვან ტექსტში საჭიროა გამოვიყენოთ **AcadNusx.** შრიფტის ზომა – 12. სტატიას თან უნდა ახლდეს CD სტატიით.

2. სტატიის მოცულობა არ უნდა შეადგენდეს 10 გვერდზე ნაკლებს და 20 გვერდზე მეტს ლიტერატურის სიის და რეზიუმეების (ინგლისურ, რუსულ და ქართულ ენებზე) ჩათვლით.

3. სტატიაში საჭიროა გაშუქდეს: საკითხის აქტუალობა; კვლევის მიზანი; საკვლევი მასალა და გამოყენებული მეთოდები; მიღებული შედეგები და მათი განსჯა. ექსპერიმენტული ხასიათის სტატიების წარმოდგენისას ავტორებმა უნდა მიუთითონ საექსპერიმენტო ცხოველების სახეობა და რაოდენობა; გაუტკივარებისა და დაძინების მეთოდები (მწვავე ცდების პირობებში).

4. სტატიას თან უნდა ახლდეს რეზიუმე ინგლისურ, რუსულ და ქართულ ენებზე არანაკლებ ნახევარი გვერდის მოცულობისა (სათაურის, ავტორების, დაწესებულების მითითებით და უნდა შეიცავდეს შემდეგ განყოფილებებს: მიზანი, მასალა და მეთოდები, შედეგები და დასკვნები; ტექსტუალური ნაწილი არ უნდა იყოს 15 სტრიქონზე ნაკლები) და საკვანძო სიტყვების ჩამონათვალი (key words).

5. ცხრილები საჭიროა წარმოადგინოთ ნაბეჭდი სახით. ყველა ციფრული, შემაჯამებელი და პროცენტული მონაცემები უნდა შეესაბამებოდეს ტექსტში მოყვანილს.

6. ფოტოსურათები უნდა იყოს კონტრასტული; სურათები, ნახაზები, დიაგრამები - დასათაურებული, დანომრილი და სათანადო ადგილას ჩასმული. რენტგენოგრამების ფოტოასლები წარმოადგინეთ პოზიტიური გამოსახულებით **tiff** ფორმატში. მიკროფოტოსურათების წარწერებში საჭიროა მიუთითოთ ოკულარის ან ობიექტივის საშუალებით გადიდების ხარისხი, ანათალების შეღებვის ან იმპრეგნაციის მეთოდი და აღნიშნოთ სურათის ზედა და ქვედა ნაწილები.

7. სამამულო ავტორების გვარები სტატიაში აღინიშნება ინიციალების თანდართვით, უცხოურისა – უცხოური ტრანსკრიპციით.

8. სტატიას თან უნდა ახლდეს ავტორის მიერ გამოყენებული სამამულო და უცხოური შრომების ბიბლიოგრაფიული სია (ბოლო 5-8 წლის სიღრმით). ანბანური წყობით წარმოდგენილ ბიბლიოგრაფიულ სიაში მიუთითეთ ჯერ სამამულო, შემდეგ უცხოელი ავტორები (გვარი, ინიციალები, სტატიის სათაური, ჟურნალის დასახელება, გამოცემის ადგილი, წელი, ჟურნალის №, პირველი და ბოლო გვერდები). მონოგრაფიის შემთხვევაში მიუთითეთ გამოცემის წელი, ადგილი და გვერდების საერთო რაოდენობა. ტექსტში კვადრატულ ფჩხილებში უნდა მიუთითოთ ავტორის შესაბამისი N ლიტერატურის სიის მიხედვით. მიზანშეწონილია, რომ ციტირებული წყაროების უმეტესი ნაწილი იყოს 5-6 წლის სიღრმის.

9. სტატიას თან უნდა ახლდეს: ა) დაწესებულების ან სამეცნიერო ხელმძღვანელის წარდგინება, დამოწმებული ხელმოწერითა და ბეჭდით; ბ) დარგის სპეციალისტის დამოწმებული რეცენზია, რომელშიც მითითებული იქნება საკითხის აქტუალობა, მასალის საკმაობა, მეთოდის სანდოობა, შედეგების სამეცნიერო-პრაქტიკული მნიშვნელობა.

10. სტატიის ბოლოს საჭიროა ყველა ავტორის ხელმოწერა, რომელთა რაოდენობა არ უნდა აღემატებოდეს 5-ს.

11. რედაქცია იტოვებს უფლებას შეასწოროს სტატია. ტექსტზე მუშაობა და შეჯერება ხდება საავტორო ორიგინალის მიხედვით.

12. დაუშვებელია რედაქციაში ისეთი სტატიის წარდგენა, რომელიც დასაბეჭდად წარდგენილი იყო სხვა რედაქციაში ან გამოქვეყნებული იყო სხვა გამოცემებში.

აღნიშნული წესების დარღვევის შემთხვევაში სტატიები არ განიხილება.

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CORRELATION OF FETAL MEASUREMENTS WITH GESTATIONAL AGE IN 144 ABORTED FETUSES: A CROSS-SECTIONAL HOSPITAL-BASED OBSERVATIONAL STUDY

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Abstract.

Background: Determination of correct gestational age is fundamental to obstetric care and is important during an autopsy as well as for clinical assessment of the growth of the fetus. Various fetal parameters like fetal anthropometry are used for the calculation of Gestational Age (The present study aimed to study the correlation between fetal anthropometric measurements like Crown-Rump length, Femur length, Head Circumference (HC), Bi-Parietal diameter (BPD) and Abdominal Circumference (AC) and Gestational age to derive regression equations for the same.

Methods: This cross-sectional hospital-based observational study was conducted at Alkharama Hospital, Baghdad; TS involved 144 aborted fetuses without congenital anomalies, aged between 12 to 40 weeks of gestational age. As per the standard protocol, the fetal measurements were documented. Regression equations are derived for the anthropometric measurements.

Results: In the present study, the correlation coefficients of the equation are 0.937, 0.984, 0.982, 0.987, 0.991, and 0.992, respectively, for birth weight, HC, CRL, BPD, FL, and AC. Gestation has a robust positive association with all other indices, with correlation coefficients ranging from 0.94 to 0.99, all of which are statistically significant at $p < 0.001$.

Conclusion: All fetal measures exhibit a positive correlation with gestational age. FL (R=0.991) and AC (R=0.992) exhibit the highest correlations with GA.

Key words. Gestational age, crown-rump length, foot length, head circumference, bi-parietal diameter, and abdominal circumference.

Introduction.

Fetal growth and the relationship between fetal measurements preceding birth and gestational age are helpful in forensics, research, and clinical practices. Fetal biometric measurements, including biparietal diameter (BPD), head circumference (HC), abdominal circumference (AC), femur length (FL), and crown-rump length (CRL), are widely used to assess fetal growth and maturity, especially through ultrasonography. These measurements not only assist clinicians in managing pregnancy-related decisions, such as labor timing and monitoring fetal development, but also play a crucial role in medico-legal contexts, particularly in estimating fetal age in cases of spontaneous abortion or termination of pregnancy [1,2]. If an abortion is reported, knowing the fetal measurements and gestation should help clinicians estimate the age of the fetus more accurately [3]. However, there is significant variability in the recordings of fetal measurements for correlation with gestational age, antemortem, and postmortem, based on the type, number, and experience of the doctor or paramedical staff involved or the diameter of the curvilinear transvaginal probe [3,4].

The measurement of gestational age has practical value for clinicians in providing important information about the pregnancy and also has epidemiologic utility for population health analysis [5]. Gestational age is used in estimating other important benchmarks of growth and is of epidemiologic interest in its own right [6]. For example, the timing of preterm birth deliveries, a widely accepted proxy indicator of newborn health, is typically expressed in completed weeks of gestation at birth. The present study therefore aimed to investigate the correlation between various fetal measurements and gestational age before birth, as this may be useful in establishing the gestation of an aborted fetus with more certainty [7]. This may have important implications for clinical practice [8]. The first attempt at applying mathematical modeling for predicting gestation described pre- and post-mortem fetuses which had been lengthened by stretching and measuring. Another attempt at this method found it difficult to stretch the fetuses [9]. The most forceful stretch that they could bear without distortion appeared to have extended the fetus only a small fraction of a dead fetus's original length. Its application is also limited as for most of gestation, the fetus fills the uterus' cavity and the measurements may be influenced by the uterine dimensions [10,11]. It was suggested that the live fetus grows to harmonize with the uterus, and this constant act of seeing creates a growing and thinning effect conducive to longer lengths. Longitudinal studies on live-born children have proved their linear growth, and it is then that the measurement of length becomes a good index to study growth and development. Similar trends have been reported; however, their means differ statistically supporting the model. Feminologists have studied this ratio several times, although their data remain controversial.

Many prior studies have focused on finding the correlation between gestational age and fetal parameters. Many studies have compared the average fetal measurements in each week of gestation in a cohort of fetuses, whereas a few have used a cross-sectional design. A study of the fetal crown-rump length conducted in a cohort of pregnancies proved to be a good predictor of gestational age; the impact of ethnicity was insignificant in this study. It was concluded that if non-metric characteristics, even sonographic signs of fetal well-being, were present, it is justified to question the conclusions, as the non-specified biological characteristics may have a bearing on the ultrasonographic gestational age. Another study was done using pregnancies of Hispanic and white women; they found the fetal crown-rump length to be shorter among Hispanic women. The accuracy of gestational age prediction using biparietal diameter was found to be lower in Hispanic women [11-13].

This study primarily aims to enhance forensic and pathological assessment of fetal age by analyzing fetal biometric data collected from aborted fetuses. Through statistical modeling, we seek to identify which anthropometric parameters exhibit the strongest correlation with GA. Specifically, this research:

Evaluates the linear relationship between key fetal measurements and GA.

Derives regression equations to estimate GA based on these parameters.

Assesses the predictive value and accuracy of each parameter, considering their potential application in both prenatal diagnostics and forensic evaluations.

Materials and Methods.

Study Design and Setting:

This observational hospital-based cross-sectional study was conducted at Alkharama Hospital, Baghdad. Ethical clearance was obtained from the institutional ethics committee of the Iraqi Medical Research Center Dr Hany Akeel Institute. The search was conducted over four years, from 2020 to 2023.

Sample size:

This study involved 144 aborted fetuses aged between 12 to 40 weeks of gestational age. The fetuses were acquired from the Department of Obstetrics and Gynecology following unavoidable abortion, spontaneous miscarriage, stillbirth, or medical termination of pregnancy due to contraceptive failure or undesired pregnancy. Informed permission was secured from the parents and/or legal guardians before participation.

Inclusion Criteria:

The study encompassed aborted normal babies with a gestational age ranging from 12 to 40 weeks.

Exclusion Criteria:

- Ø Fetuses with gross congenital anomaly.
- Ø Macerated fetuses.
- Ø Maternal history of infections such as TORCH, and HIV.
- Ø Mothers below 18 years of age.

Methodology:

The study samples were categorized into seven groups according to their gestational and fetuses of each age group were studied, as shown in Table 1. Fetuses were obtained in 10% formalin promptly following a stillbirth, abortion, or medical termination of pregnancy. The demographic data of fetuses, such as gender, weight, and gestational age, were documented. The weight in grams was measured using an electronic weighing scale. Morphometric measures of fetuses were conducted using nylon thread by the autopsy protocol, as seen in Table 2.

By placing the fetus in the supine position, the distance between the crown of the head to the highest point on the trunk corresponds to crown rump length (CRL). Head circumference (HC) is measured from the glabella to the most prominent point posteriorly; abdominal circumference (AC) was recorded at the level of the umbilicus.

Statistical Analysis:

Descriptive statistics (mean, range, standard deviation) were used to summarize the data. Simple linear regression analysis was performed to evaluate the relationship between each fetal parameter and gestational age. Pearson's correlation coefficients (R) and coefficients of determination (R^2) were calculated. Statistical analysis was performed using Python version 3.11.4 and the scikit-learn library version 1.3.0.

Results.

The current study comprised (144) aborted normal babies, with gestational ages ranging from 12 to 40 weeks. Despite our limited sample size, we included representation from all fetal ages except for 13, 15, 24, 30, and 37 weeks. The fetuses were categorized according to gestational age and sex. Among the 144 fetuses, 76 were male and 68 were female (Table 1). The greatest number of study samples was recorded in fetuses at 21 and 23 weeks of gestation, with 13 and 10 instances each. Conversely, there was a singular instance for gestational ages of 19, 25, 35, and 39 weeks.

According to data collected from the Department of Obstetrics and Gynecology in the present study, we observed the following comorbidities. Abruption placenta in 4 cases, hyperemesis gravidarum in 6 cases, septate or bi-cornuate uterus in one case, scar rupture in 8 cases, severe anemia in 13 cases, anhydramnios in 10 cases, gestational DM in 11 cases, hypothyroidism in 6 cases, pre-eclampsia in 8 cases and one case of polyhydramnios [14].

The distribution of maternal age in the sample ranged from 20 to 36 years, with a mean age of 26.753 years. Most mothers were 26 years old, with a slight positive skewness indicating a distribution leaning towards younger mothers. The gestation period varied between 12 and 40 weeks, with a mean of 26.169 weeks and a median of 26 weeks. The mode for gestation stood out at 21 weeks, and the distribution was nearly symmetric with a slight negative kurtosis [15,16].

The range of fetal weight in the study extended from a mere 22.0 grams to 3750.0 grams, with an average weight of 1208.455 grams. The data for fetal weight showcased a positive skewness, indicating a higher frequency of lower weights in the sample. Head circumference (HC) measurements ranged from 66.0 to 350.0 mm, with an average of 235.094 mm. The mode, at 329 mm, suggests a relatively frequent larger head circumference, and the distribution showed a mild negative skewness [17,18].

The crown-rump length (CRL) ranged from 52.0 to 438.0 mm within the sample, with a mean of 226.421 mm. The distribution of CRL exhibited a minor positive skewness. The bi-parietal diameter (BPD) readings varied from 18.0 mm to 96.5 mm, with a mean of 63.245 mm. Both FL (Femur length) and BPD distributions demonstrated a negative skewness and kurtosis, indicating a peakier and left-leaning distribution. The former ranged from 11.0 to 74.0 mm with an average of 46.161 mm, and the latter, as mentioned earlier. Lastly, the abdominal circumference of the fetuses in the study varied between 48.0 and 378.0 mm, with a mean measurement of 215.89 mm. The distribution for abdominal circumference was the most symmetric among all variables, with minimal skewness and kurtosis close to that of a normal distribution [19].

Linear Regression Analysis for Various Parameters:

A simple linear regression analysis was performed to assess the connection between several fetal markers and gestational age. The results are presented in Table 3.

The parameters showcased in the table above are significant predictors of gestational age. Here's a brief overview:

1. Fetal Weight:

For every unit increase in fetal weight, the gestational age increases by 0.007 weeks, with a starting intercept of 18.008 weeks. The correlation coefficient R is 0.937, indicating a strong positive relationship. The R^2 value of 0.877 suggests that 87.7% of the variability in gestational age can be explained by fetal weight. The standard error of estimate (SEE) for this Parameter is 2.718.

2. HC (Head Circumference):

The HC showed a strong positive correlation with gestational age, with an R-value of 0.984. The R^2 value of 0.968 means that approximately 96.8% of the variation in gestational age can be attributed to changes in HC.

3. CRL (Crown-Rump Length):

The CRL also has a high correlation with gestational age, as

Table 1. *Distribution of Fetuses as per Gestational Age and gender.*

Groups	GA in weeks	No of Fetuses	Lung Specimens Male:	Lung Specimens Female:
I	12-16	16	10	6
II	17-20	26	13	10
III	21-24	26	13	10
IV	25-28	26	11	12
V	29-32	18	10	8
VI	33-36	28	11	16
VII	37-40	14	8	6
Total		144	76	68

Table 2. *Showing the range of fetal anthropometric measurements and their mean as per GA.*

GA in Weeks	No of Fetuses	Range of Birth Wt.	Range of CRL in mm	Range of HC in mm	Range of BPD in mm	Range of FL	Range of AC
12	6	22-61.5	52-58.5	66-69.5	18-21.5	11-12	48-64
14	6	105-118	74-76	102-110	28-29.5	15-17	88-92
16	4	120-145	96-105	129-132	32-34	19-21	105-109
17	8	160.5-190	94-124	130-136	32-38	21-24	111-121
18	8	240-265.5	127-130	152-155	39.5-41.5	27-29	130-138
19	3	250	124	150	39.5	27	128
20	8	255-370	140.5-149.5	162-188	44-50	29.5-34	153-161
21	10	250-445	144-164	187-195	50-52.5	34-38	152-173
22	6	315-590	172-196.5	194-210	52.5-55	37.5-40	169-187
23	10	330-650	158-195	194-222	52.5-58	38-42	172-194
25	2	414	191	186.2	54	41	185
26	8	680-810	197.5-210	250.5-253.5	68-70	47-49	217-229
27	8	710-1050	201-222	245.5-261	66-71	46-52	213-228
28	8	840-1210	220-258	260-271	67-72	49-52.5	224-238
29	8	1050-1400	258-268.2	275-281	73.5-75	50-54	232-254
31	4	1750-1815	293-295	290-292	78-79	59	271-273
32	6	1250-2250	284.5-315	289.5-302	78.482.2	58-54.4	266-299
33	4	1950-2350	315-321	290-310	80.5-85	61-65.5	275-302
34	8	2050-2450	317-325	292-320	82-86	65-67.5	294-310
35	2	2230-2720	361-366	320-326.5	86-89	65-68	298-320
36	8	2950-3100	280-379	327-330	88-91	67-70	309-328
38	8	2240-3750	385-415	329-344	87-91	68-74	311-340
39	2	2500	380	330	89	69	323
40	4	3550-3750	421-438	347-350	94.596.5	73-74	365-378

Table 3. *Showing the Simple Linear Regression Summary.*

Parameter	Coefficient	Intercept	R	R^2	SEE
Fetal Weight	0.007	18.008	0.937	0.877	2.718
Head Circumference	0.098	3.117	0.984	0.968	1.381
crown-rump length	0.074	9.335	0.982	0.964	1.471
Bi-Parietal diameter	0.36	3.398	0.987	0.974	1.24
Femur Length	0.426	6.496	0.991	0.982	1.037
Abdominal Circumference	0.093	6.104	0.992	0.984	0.967

SEE standard error of estimate in weeks.

Table 4. *Showing the Correlation Analysis among Fetal Parameters and GA.*

	Gestation	Fetal Weight	HC	CRL	BPD	FL	AC
Gestation	1	0.94	0.98	0.98	0.99	0.99	0.99
		(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)
Fetal Weight	0.94	1	0.9	0.95	0.91	0.92	0.94
	(<0.001)		(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)
Head Circumference	0.98	0.9	1	0.96	1	0.99	0.99
	(<0.001)	(<0.001)		(<0.001)	(<0.001)	(<0.001)	(<0.001)
crown-rump length	0.98	0.95	0.96	1	0.96	0.97	0.98
	(<0.001)	(<0.001)	(<0.001)		(<0.001)	(<0.001)	(<0.001)
Bi-Parietal diameter (BPD)	0.99	0.91	1	0.96	1	1	0.99
	(<0.001)	(<0.001)	(<0.001)	(<0.001)		(<0.001)	(<0.001)
Femur Length	0.99	0.92	0.99	0.97	1	1	1
	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)		(<0.001)
Abdominal Circumference	0.99	0.94	0.99	0.98	0.99	1	1
	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	

indicated by its R-value of 0.982. Approximately 96.4% of the variation in gestational age can be explained by CRL.

4. BPD (Biparietal Diameter):

BPD exhibits a strong correlation with gestational age, with an R-value of 0.987, indicating that about 97.4% of the variation in gestational age can be attributed to BPD.

5. FL (Femur Length):

FL has the highest correlation coefficient (R-value of 0.991) among the parameters, implying that it has a very strong association with gestational age.

6. AC (Abdominal Circumference):

AC also displays a high correlation with gestational age, with an R-value of 0.992. This indicates that AC is a substantial predictor of gestational age. In conclusion, all fetal measures exhibit a favorable correlation with gestational age. Femur Length and Abdominal Circumference have the strongest association, rendering them the most predictive for Gestational Age.

Correlation Analysis among Fetal Parameters and Gestation Age:

Correlation analysis was performed to determine the strength and direction of the linear relationships between fetal parameters and gestation age. The results are summarized in the provided table, which displays the Pearson correlation coefficients and their significance levels (Table 4).

Discussion.

GA estimation is an essential step for the management of pregnancy. In the present study, we have analyzed the accuracy of six parameters like head circumference (HC), Bi-parietal diameter (BPD), fetal weight, crown-rump length (CRL), abdominal circumference (AC), and femur length (FL) for the calculation of GA. Regression formulas for all six were also given and our findings are in conclusion with the literature [20-22]. Gestation has a robust positive association with all other indices, with correlation coefficients between 0.94 and 0.99, all statistically significant at $p<0.001$[23,24]. This signifies that when gestation advances, the other fetal parameters often escalate correspondingly. Fetal Weight highly correlated with gestation (0.94) and all other parameters, with values ranging from 0.9 to 0.95, all statistically significant. HC (Head Circumference) presents an extremely high correlation with gestation (0.98) and other parameters, especially BPD and FL, where it shows a high correlation of 0.99. Similar findings were noted in a study by Naji et al. [21,25]. CRL (Crown-Rump Length) is strongly correlated with gestation (0.98) and has high correlation values with all other parameters, ranging from 0.95 to 0.98. BPD (Bi-parietal Diameter) shows an almost perfect correlation with gestation (0.99) and exhibits a high correlation of 0.99 with HC and FL, indicating that these parameters increase in a fixed proportion to each other [26]. Similar findings were seen by Leggett DS [27]. FL (Femur Length) has a very high correlation with gestation (0.99) and shows a high correlation of 0.99 with HC, BPD, and AC, implying a direct proportionality in their rates of increase, which correlates with another study [28-30]. AC (Abdominal Circumference) demonstrates an extremely high correlation with gestation (0.99) and a perfect correlation of 1.0 with FL, indicating a consistent linear relationship between them similar to Abdelrazek et al. [31-34].

For calculating the gestational age and predicting EDD during the first trimester of pregnancy, the Crown-rump length (CRL) is considered ideal. Desire et al. [35] concluded that CRL is a better marker for GA. However, with advancing gestational age due to excessive curvature of the fetus and the variable position of the fetus, its accuracy drops owing to the difficulty in measuring the complete length of the fetus. In the second and third trimesters, remaining fetal measurements have been commonly used to assess the gestational age [36,37].

Measuring estimated fetal weight (EFW) can be more helpful when compared to the above-mentioned parameters for the assessment of adequate fetal growth [38,39]. We observed that when measured separately, FL and AC have the highest correlation, making them the most reliable predictors for the assessment of fetal growth [40-45]. The present study further revealed that low maternal hemoglobin levels during pregnancy were associated with low birth weight, and other parameters were lower in the anemic group, which correlated with the findings of Video et al and Berrin Awad et al. [21]. We also noticed that maternal hypothyroidism before and during pregnancy was associated with low anthropometric parameter measurements, which correlated with other studies [1,46,47].

Conclusion.

In summary, some antemortem fetal anthropometric measurements in our study were weakly to moderately correlated with GA and were precise when referring to the GA of aborted fetuses at various gestational weeks. In conclusion, FL and AC exhibited the most robust connection with gestational age in our cohort, indicating they are dependable metrics for assessing fetal age in aborted babies. Additional multicenter research with larger sample sizes is advised to corroborate these findings.

Recommendations for Future Research.

For future research, the primary need was already indicated in the method section. We ought to emphasize the importance of the need to adjust for the effects of the post-ovulatory age and the method of abortion on the fetal growth parameters. Collecting data on multiple covariates that might affect fetal growth is important to avoid biased results. Another concern is the fact that we did not consider the sex of the fetuses in our analysis. Other factors, as well, known to affect fetal growth should be considered to gain a comprehensive understanding of how the anthropometrics of the adults were affected by the various gestational weeks. From the statistical point of view, the use of more accurate methods and techniques for obtaining findings and the use of statistical modeling with modern and powerful computing systems to determine fetal growth patterns might provide important information.

For future research on the method topic, it seems necessary to stress the importance of alternative methods and techniques to confirm the findings. Factors such as the sex of the researched individuals, considering the follow-up of the intrauterine development, and comparing this follow-up to the offspring after birth or even during gestation, have not been included in the data from previous studies. The standard protocol and the gold standard for fetal anthropometric measurements at the various gestational weeks appear to be topics that are lacking in the scientific literature. It would be interesting to apply the observed findings to early pregnancy ultrasonography in live fetuses for prenatal identifications of fetuses with growth suspensions. Our future studies will certainly focus on these concerns.

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