ORIGINAL ARTICLE

The Value of Early Pregnancy Assessment Clinic in the Improvement of Quality of Antenatal Care

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Objective: To determine the prevalence of abnormal and complicated pregnancies detected at the first visit of first trimester women attending the early pregnancy assessment clinic (EPAC), to compare the need for gestational age (GA) re-dating between clinically precise and imprecise groups, and to evaluate the prevalence and factors influencing acceptance of prenatal screening (PNS) or diagnosis (PND).

Materials and Methods: A retrospective cohort study was conducted at the EPAC, Maternal Fetal Medicine (MFM) Unit, Thammasat University Hospital (TUH), between July 4 and September 30, 2025. Women with a positive urine pregnancy test (UPT) and GA of less than 14 weeks were included. Data were retrieved from the hospital database. Abnormal and complicated pregnancies were assessed. GA re-dating was analyzed between clinically precise and imprecise groups. Acceptance of PNS or PND was also evaluated.

Results: One thousand six hundred sixty-five pregnant women were enrolled (986 in the clinically precise group and 679 in the imprecise group). Ultrasonography (USG) identified 110 abnormal and complicated pregnancies (6.6%), most commonly early embryonic death, followed by twins, anembryonic pregnancy, and ectopic pregnancy. After excluding early pregnancy failures, 1,578 women remained. Clinically precise women were 1.7 times more likely not to require GA re-dating ($p<0.05$). For PNS or PND analysis, 1,577 women were included (triplet pregnancy excluded), of whom 864 (54.8%) accepted testing. Acceptance was significantly associated with advanced maternal age (AMA), Thai nationality, and Buddhist religion. Non-invasive prenatal screening (NIPS) was the most frequently chosen test.

Conclusion: EPAC enabled early USG detection of abnormal and complicated pregnancies, with early embryonic death being most common. Clinically precise women required significantly less GA re-dating than women in the imprecise group. Only half accepted PNS or PND after counseling, influenced by AMA, Thai nationality, and Buddhist religion, with NIPS most frequently selected.

Keywords: Early pregnancy assessment clinic; Quality of antenatal care; Prenatal screening; Prenatal diagnosis

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Early pregnancy assessment clinic (EPAC) originated in the early 1990s to manage early pregnancy complications[1]. Timely evaluation, treatment, and follow-up improved the quality of care[2]. Non-viable pregnancies are common, accounting for 10% of first trimester losses[3]. Thammasat University Hospital (TUH) established EPAC in 2014. Women with a positive urine pregnancy test (UPT) and gestational age (GA) less than 14 weeks underwent ultrasonography (USG). Non-viable cases were referred to the Gynecology Outpatient Department, whereas viable cases received GA confirmation, planning, and prenatal counseling before antenatal care (ANC).

Accurate expected date of delivery (EDD) is crucial for maternal interventions and favorable outcomes[4]. Many low- and middle-income settings still rely on last menstrual period (LMP) dating despite recall bias, irregular cycles, and contraceptive use[4-6]. USG dating is more precise and standard[4,5]. The World Health Organization and the Royal Thai College of Obstetricians and Gynecologists recommend early USG for GA confirmation, detection of multiple gestations, and risk assessment[7,8], though access in rural Thailand remains limited[9].

Currently, non-invasive prenatal screening (NIPS) is widely practiced in Thailand. Chromosomal abnormalities occur in 0.5% to 1.0% of live births, with trisomy 21 as the most frequent, followed

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by trisomy 18 and 13[10]. Prognosis is poor, with first-year survival at approximately 1% for trisomy 18 and 10% for trisomy 13[11]. Although prenatal screening (PNS) or diagnosis (PND) are important, Thailand's national data are limited, despite a 2020 study that reported 91.1% acceptance of PNS after counseling[12].

As a one-stop service, EPAC of TUH enabled systematic data collection on abnormal and complicated pregnancies, need for GA re-dating by USG, and prevalence and factors of PNS and PND acceptance.

Materials and Methods

This retrospective cohort study was conducted at the EPAC, maternal fetal medicine (MFM) unit, TUH, Thailand, between July 4 and September 30, 2025. The study was approved by the Human Research Ethics Committee of TUH (MTU-EC-OB-0-129/68). Women who attended the EPAC with a positive UPT and a GA of less than 14 weeks based on the LMP were recruited. Exclusion criteria included women whose first ANC visit was at another hospital or clinic, prior USG for estimation of the EDD, referral from another hospital to continue ANC at TUH, and conception through infertility procedures such as intracytoplasmic sperm injection (ICSI) or in vitro fertilization (IVF).

The sample size was calculated using $Z\alpha=2.58$, a margin of error (d) of 0.03, and an expected proportion (P) of 0.25. The proportion of pregnant women who visited the EPAC compared with those who delivered at TUH was 25.71%, according to the monthly report. The required number of participants was 1,387. An additional 20% was added to account for potential data loss, resulting in a total sample size of 1,665 cases.

After reviewing all the data from the hospital database, the information was recorded in the case report form. The collected data were categorized into 15 items, including demographic information (age, nationality, religion, occupation, and hometown) and obstetric and gynecologic history such as gravida, para, abortions, and living children (G-P-A-L), LMP, menstrual cycle regularity, duration of hormonal contraceptive discontinuation, GA by LMP, GA by USG, GA re-dating, abnormal and complicated pregnancies, acceptance, and types of PNS or PND.

Abnormal and complicated pregnancies were classified into seven categories, including early embryonic death, anembryonic pregnancy, ectopic pregnancy, twin pregnancy, triplet pregnancy, molar pregnancy, and inconclusive pregnancy. All data were presented as percentages. Pregnant women were classified into two groups. The clinically precise group consisted of women who could accurately recall LMP, had a regular menstrual cycle, and were not pregnant during the use or residual effect of hormonal contraception. All other women were classified as a clinically imprecise group. The ratio of GA re-dating by USG was compared between these groups. Criteria for GA re-dating are as follows: for pregnancies of $8^{6/7}$ weeks or less by LMP, GA re-dating is required if the crown-rump length (CRL) measurement shows a discrepancy of more than five days compared with the USG-derived GA. Similarly, for pregnancies with GA $9^{0/7}$ to $13^{6/7}$ weeks according to LMP, re-dating is indicated if the CRL differs by more than seven days from the USG estimate[13]. GA re-dating statistical analysis was conducted using the chi-square test, while maternal characteristics of both groups were presented as means with standard deviations or as percentages.

The proportions of pregnant women who accepted or declined PNS or PND after receiving counseling at the EPAC were reported. Factors associated with the decision to accept or decline PNS or PND were analyzed using Poisson loglinear regression with the Wald chi-square test. Statistical significance for all analyses in this study was defined as a p-value less than 0.05.

Results

One thousand six hundred sixty-five pregnant women who attended the EPAC were enrolled in the present study. All women underwent USG at their first visit, which identified 110 cases (6.6%) of abnormal or complicated pregnancies. Abnormal pregnancies in the present study included early embryonic death, anembryonic pregnancy, ectopic pregnancy, and molar pregnancy, while complicated pregnancies comprised twin and triplet pregnancies. The remaining cases were classified as inconclusive pregnancies but were included in the abnormal pregnancy group in the present study for analytic purposes.

The present study revealed that early embryonic death was the most frequent finding at 58 out of 110 (52.7%), followed by twin pregnancy at 22 out of 110 (20.0%), anembryonic pregnancy at 15 out of 110 (13.7%), and ectopic pregnancy at nine out of 110 (8.2%). Both molar and triplet pregnancies were rare, occurring in only one case each (0.9%), while

Table 1. Comparison of maternal characteristics between clinically precise and clinically imprecise groups

	Precise (n=986)	Imprecise (n=679)	p-value*
Age (years); mean±SD	31.9±5.8	29.8±6.1	<0.001
AMA; n (%)	433 (43.9)	201 (29.6)	<0.001
Thai; n (%)	768 (77.9)	513 (75.6)	0.266
Buddhist; n (%)	946 (95.9)	624 (91.9)	<0.001
Employee; n (%)	327 (33.2)	170 (25.0)	<0.001
Pathum Thani; n (%)	758 (76.9)	466 (68.6)	<0.001
Primigravida; n (%)	379 (38.4)	266 (39.2)	0.762
Nulliparous; n (%)	466 (47.3)	327 (48.2)	0.719
History of abortion; n (%)	245 (24.8)	156 (23.0)	0.380

SD=standard deviation; AMA=advanced maternal age

* Chi-square test

inconclusive pregnancies accounted for four cases (3.6%), as shown in Figure 1.

The 1,665 participants were categorized into two groups: the clinically precise group (986 participants) and the clinically imprecise group (679 participants). As shown in Table 1, women in the clinically precise group were significantly older and more likely to be of AMA, Buddhist, employed as employees, and residents of Pathumthani compared with those in the clinically imprecise group.

Eighty-seven abnormal pregnancies were excluded from the analysis of the association between clinical precision and GA re-dating, as they were classified as non-viable, leaving 1,578 cases for this analysis. Women in the clinically precise group were 1.7 times more likely not to require GA re-dating based on USG than those in the clinically imprecise group, a statistically significant difference, as illustrated in Figure 2.

For the analysis of acceptance of PNS or PND after counseling, in addition to excluding the 87 abnormal pregnancies, one triplet pregnancy was also excluded due to PNS or PND limitations in such cases, resulting in a final cohort of 1,577 women. Among these women, 864 (54.8%) accepted PNS or PND. Of these, 444 women were of AMA. In this group, 241 women selected amniocentesis, 195 selected NIPS, and four women each selected the quadruple test and the combined test. Among the 420 non-AMA women who accepted PNS or PND, 10 selected amniocentesis, 210 selected NIPS, 55 selected the quadruple test, and 145 selected the combined test. Factors significantly associated with acceptance included AMA, Thai nationality, and Buddhist religion, each conferring 1.8-fold higher odds compared with their respective reference groups,

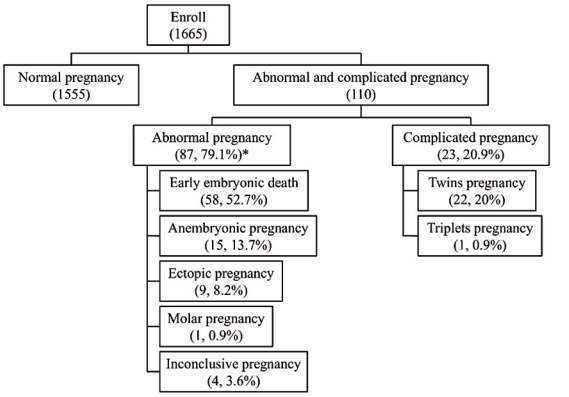

Figure 1. Flow diagram showing overall pregnancy outcomes following the first ultrasound in the EPAC (n=1,665).

* n (%)

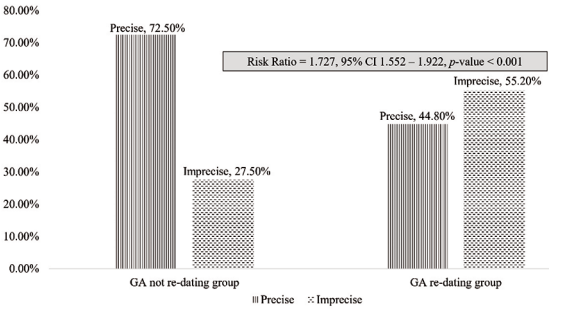

Figure 2. Association between clinical precision and GA re-dating (n=1,578).

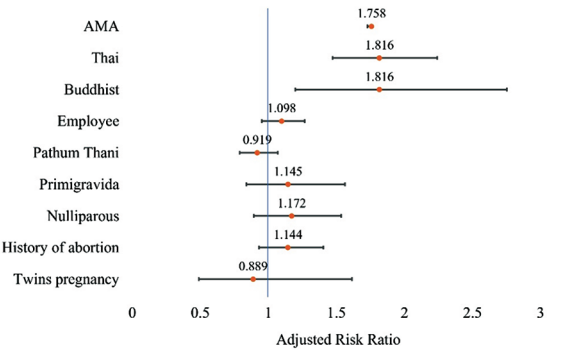

Figure 3. Factors associated with acceptance of PNS or PND (n=1,577).

AMA: advanced maternal age

as shown in Figure 3. Among those who accepted testing, NIPS was the most frequently chosen method at 405 out of 864 (46.9%), followed by amniocentesis at 251 out of 864 (29.1%), the combined test at 149 out of 864 (17.2%), and the quadruple test at 59 out of 864 (6.8%).

Discussion

Abnormal pregnancies referred to non-viable pregnancies, which could present as early embryonic death, anembryonic pregnancy, ectopic pregnancy, or molar pregnancy. This condition occurred in around 10% of clinically confirmed pregnancies[3]. A study from Egypt reported that among women followed during the first 14 weeks of gestation, the prevalence of anembryonic pregnancy was 15.6%[14]. Similarly, a study in Iran found that about one-third of spontaneous abortions were due to anembryonic pregnancy[15]. Data from 17 countries across Africa and Latin America showed that abnormal pregnancies, including ectopic pregnancy and molar pregnancy, accounted for 9.9%. Ectopic pregnancy represented 7.8%, while molar pregnancy was 2.1%, with higher prevalence rates found in African countries compared to Latin America[16].

The establishment of EPAC has played an important role in providing timely care for women in early pregnancy, particularly in the early detection of abnormal and complicated pregnancies. EPAC services have been shown to reduce emergency department revisits, especially for women with ectopic pregnancies, while also offering patients more treatment choices, including surgical or medical options such as methotrexate[17].

According to the present study, the EPAC at TUH operated as a one-stop service, with one of its principal roles being the early detection of abnormal and complicated pregnancies. The overall detection rate of abnormal and complicated pregnancies was 6.6%. Among these, early embryonic death accounted for 52.7%, anembryonic pregnancy for 13.6%, ectopic pregnancy for 8.2%, and molar pregnancy for 0.9%. These findings were in line with prior studies[14,16]. Furthermore, a complicated twin pregnancy was identified in 22%, which was consistent with a study conducted in Nakhon Nayok, Thailand, where the prevalence of twin pregnancy was approximately 18%[9]. Since early identification of multiple gestations requires assessment of amnionicity and chorionicity[18], women diagnosed at the present study's EPAC benefited from comprehensive screening and counseling, which helped guide appropriate ANC planning. Meanwhile, non-viable pregnancies were referred to the Gynecology Outpatient Department for counseling, management options, and treatment, thus reducing unnecessary antenatal blood tests.

Accurate GA assessment had clear benefits on pregnancy outcomes, such as scheduling and interpretation of certain antepartum tests, determining the appropriateness of fetal growth, designing interventions to prevent preterm births, and reducing the rate of post-term induction[13]. A study conducted in Thailand reported that pregnant women with either reliable or unreliable clinical information showed no significant difference in the need for GA adjustment by ultrasound. Notably, half of the women required re-dating, despite the absence of any clinical signs indicating such a need[9]. In contrast, analysis showed that women with clinically precise dating were twice as likely to avoid GA adjustment compared with women with imprecise histories, and this difference was statistically significant. This highlights the importance of careful history-taking for estimating GA, which not only allows for optimized ANC planning but also reduces unnecessary reliance on ultrasound in areas where it might not be accessible.

The expanded use of first trimester genetic screening techniques has been associated with increased prenatal detection of congenital anomalies, leading to higher termination rates and reduced prevalence of infants born with major congenital anomalies in the general population[19]. In Thailand, a study in Chiang Mai reported 97.9% acceptance of maternal serum screening[20], while a study in Nakhon Nayok found 91.1% acceptance after women received genetic counseling specifically about Down syndrome[12].

In contrast, the findings indicated that only 54.8% acceptance of PNS or PND following prenatal counseling, which included the detection of a wider range of chromosomal abnormalities beyond Down syndrome. Factors significantly associated with acceptance of PNS or PND were AMA, Thai nationality, and Buddhist religion. However, a limitation of this retrospective cohort study was the lack of information on education level and household income, which might also influence decisions. The higher prevalence of fetal chromosomal abnormalities with older maternal age[21] explained the increased acceptance in that group. Consistent with the findings of the present study, women in the AMA group were approximately 1.8 times more likely to accept PNS or PND than non-AMA women. Regarding nationality, Thai women had better comprehension and appreciation of the tests due to the absence of language barriers. Religion also influenced the decision, as Buddhists were more likely to accept compared to Christians and Muslims. The reason was religious beliefs, consistent with findings from South Africa, where Muslim women were significantly less

likely to accept amniocentesis compared to women of other religions[22].

Twin pregnancy was not a significant factor influencing acceptance, likely because the number of twin pregnancies in the present study was small, precluding definitive conclusions. In addition, counseling in such cases may be challenging, as no available prenatal screening test demonstrates accuracy in twin gestation comparable to that in singleton pregnancy, and data regarding higher-order multiple pregnancy remains insufficient. Additionally, complications such as fetal demise, vanishing twin, or anomalies in one fetus increase the likelihood of inaccurate results for both serum screening and cell-free fetal DNA (cfDNA) testing. Therefore, these women should be counseled on the limitations and offered diagnostic testing as an alternative[21]. Many women were concerned about the potential risks of invasive procedures such as amniocentesis or chorionic villus sampling, which discourages uptake[23].

Among those who accepted screening, NIPS was the most preferred option for screening fetal chromosomal abnormalities in this study population.

Conclusion

The establishment of the EPAC at TUH enabled first trimester women to receive USG at their initial visit, allowing early detection of abnormal and complicated pregnancies. Early embryonic death was the most common abnormality, followed by twin pregnancy, which facilitated timely management and assessment of amnionicity and chorionicity. Women in the clinically precise group were significantly less likely to require GA re-dating, highlighting the continued value of menstrual history and clinical examination, particularly in settings with limited access to USG. Only about half of the women accepted PNS or PND after counseling, with AMA, Thai nationality, and Buddhist religion identified as significant factors. Among the available options, NIPS was most frequently chosen.

What is already known about this topic?

The establishment of an EPAC enables earlier detection of abnormal and complicated pregnancies, allowing timely treatment planning and appropriate ANC. Such early interventions are essential for optimizing both management strategies and pregnancy outcomes.

What does this study add?

Establishing an EPAC in a hospital allows early detection of abnormal and complicated pregnancies, supporting timely counseling, treatment, and ANC planning.

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Authors' contributions

DP contributed to the conception and design of the study, to the critical revision of the manuscript, and to the supervision of the study. UL contributed to the conception and design of the study and to the critical revision of the manuscript. CP contributed to data collection, data analysis, and interpretation, and drafting of the manuscript. KS contributed to data analysis and interpretation and to the critical revision of the manuscript. NK contributed to the statistical analysis. YC contributed to language editing and proofreading. All authors read and approved of the final manuscript.

Data availability statement

The data sets used and/or analyzed during the current study are available from the corresponding authors upon reasonable request.

Ethics approval and consent to participate

The study was approved by the Human Research Ethics Committee of TUH (MTU-EC-OB-0-129/68, dated July 3, 2025). Given the retrospective design and use of anonymized data, the requirement for informed consent was waived by the ethics committee.

Clinical trial registration

Not applicable.

Use of artificial intelligence

Artificial intelligence (AI) tools, including ChatGPT and Grammarly, were used solely for grammar and language editing. The authors are responsible for all content.

Conflicts of interest

The authors declare no conflict of interest.

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