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The Pubic Arch Angle: A Study on the Predictability of Labor and Delivery

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Abstract: Study objective: to verify if the PAA (angle of the pubic arch) is a predictive data for the mode of delivery, the duration of labour and the expulsion period. Methods: we chose to measure the PAA in 100 women recruited, chosen from the 38th to the 42th week of gestation. The method involves the use of two-dimensional transperineal ultrasound. Data collection took place over a period of time from May to September 2015. The ante-partum data taken into consideration were the patient's name and surname, PAA, parity, age, height; those acquired in the post-partum provide for the calculation in minutes of the active phase of labor, the duration of the expulsion period, the execution of the amniorrhexis and the use of the synthetic oxytocin, the fetal cranial circumference, the fetal weight and the position of the presented part. Results: results discovered ultrasoundly 100 PAA, with an average value of 115.5° and we proceeded by evaluating 90 vaginal births. Infants at birth had a CC with an average value of 34.5 mm. By relating the two variables PAA and CC for the dependent variable "period expulsion in minutes", confirming that the expulsive period depends on the relationship between PAA and CC. The average of the minutes of the expulsion period is 50' in women with a PAA > 111.5° and a CC > 34.5 mm while in women with an PAA > 111.5° the media time is 30' regardless of the CC. It has been shown that oxytocin and amniorrhexis reduce the minutes of the expulsion period only in a case of PAA > 111.5° and a CC > 34.5 mm bringing them from 60' to 23'. Conclusion: the duration of the active phase of labor is not influenced by the PAA but it depends on external factors. In the case of the expulsion period, a predictability of the PAA on its duration is shown if the CC is taken into consideration; as regards the influence of the PAA on the method of delivery, it was not possible to carry out any analysis since all the useful cases had vaginal delivery.

Key words: Pubic arch, measurement, labor evolution, delivery methods.

1. Introduction

Since the beginning of the twentieth century, obstetric pelvimetry has been an exam used to highlight in the pregnant women any pelvic flaws and/or cephalic-pelvic disproportions, so to identify before delivery those who are more likely to go to an operative birth [1, 2].

There are several known techniques for performing obstetric pelvimetry: internal, external and diagnostic imaging. Since the eighties to date, several studies have been performed that have used Radiography and Nuclear Magnetic Resonance of the pregnant pelvis for measuring maternal and fetal diameters, demonstrating a good specificity and sensitivity in the diagnosis of pelvic vices and cephalic-pelvic disproportion, and therefore a good predictability of mechanical dystocia during delivery [3].

These methods, even if they allow obtaining high quality images and therefore an optimal measurement of the diameters, are teratogenic: they damage the DNA of the fetus cells causing malformations (X-rays) and are very expensive examinations for the National Health System, not ready to use which requires the

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involvement of other professionals such as the radiologist and the radiology technician [4]. Recently, however, two studies have used ultrasound as a means of image acquisition for obstetric pelvimetry: the first was performed by the gynecologist [5] at the Chaim Sheba Medical Center in collaboration with the university's medical school of Tel Aviv in Israle, the other from the gynecologist [6] and other experts, at the Prince of Wales Hospital in collaboration with the Honk Hong University.

This method is not only less expensive than the before mentioned but is well tolerated by women, easy to use and easily available because each department has at least one ultrasound and does not require the involvement of other figures in addition to the gynecologist or obstetrician: all elements that make it potentially usable in the routine clinic.

Both studies are based on the ultrasound measurement of the PAA (pubic arch angle/angle of the pubic arch): according to the Choi's study of 2013 it was demonstrated its intra-operator and inter-operator repeatability through three-dimensional ultrasound.

It consists in the acquisition of three images of the pelvis in different anatomical planes: sagittal, coronal and axial. These are then processed by a special program able to return a single image of the pubic arch in three dimensions.

According to Gilboa on 2013, on the other hand, measured the PAA through the acquisition of a single two-dimensional transperineal ultrasound image during the contraction and voluntary maternal pushes, in women with a prolonged expulsion period.

A close correlation between the PAA and the mode of delivery emerged: as the amplitude decreased, the probability of cesarean sections and operating parts with suction cups increased [7].

Taking a cue from the work done and the results obtained, the study in question aims to verify if the PAA, measured by two-dimensional ultrasound at the end of pregnancy, then put in relation with some maternal, fetal and related to the partogram, both a predictive data for the mode of delivery, the duration of labor and the expulsive period before the beginning of labor itself.

If its predictability was confirmed, it would be possible to individualize the timing of labor and the delivery modalities of each woman.

To give adapted pre-established times the clinical case would allow us to consider, with more precision, the temporal factor, diagnosing the dynamic/mechanical dystocia more precariously than the individual times and this would give the possibility to implement clinical decisions more relevant to the case.

2. Methods

We chose to measure the PAA in pregnant women, from the 38th to the 42nd week of gestation, so that the anatomical situation of the pelvis is as similar as possible to that will occur at the time of delivery.

Data collection took place over a period of time from May to September 2015.

2.1 Data

All the antepartum and postpartum data most suitable for carrying out the study were acquired, also with the help of the partogram completed during labor and delivery, namely:

(1) Patient name and surname;

(2) The PAA and ultrasound measurement technique: by means of two-dimensional transperineal ultrasound (using the technique proposed by Gilboa). The patient is placed in a gynecological position and the ultrasound probe in transverse scan at the level of the urethra on the perineum; it is inclined 45°-50° with respect to the sagittal plane of the body, until the pubic symphysis and the right and left branches of the ischio-pubic bones are visualized (Fig. 1). Using the "Three-Point Generic Angle" function, you place the first pointer on the lower edge of the left branch, the second in the middle of the pubic symphysis and

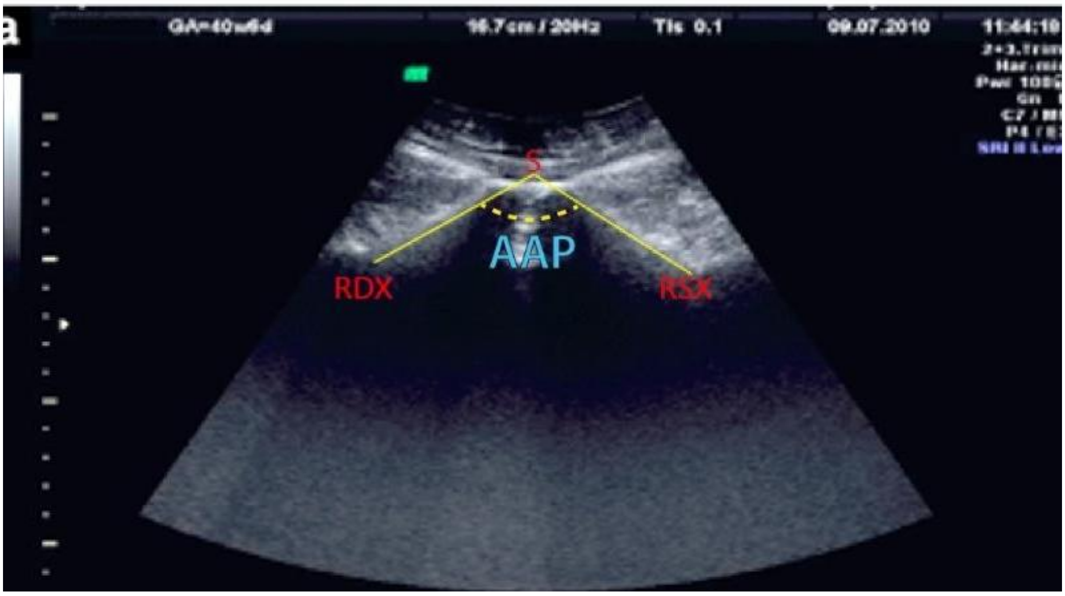

Fig. 1 Ultrasound visualization of the pubic arch. RDX: right branch of right ischial bone; RSX: left branch of left ischial bone; S: pubic symphysis.

the third on the lower edge of the right branch. The program then returns the angle in degrees [8];

(3) Equality;

(4) Age;

(5) Height;

(6) Calculation of the duration in minutes of the expulsion period;

(7) Execution of amniorrhea in labor;

(8) Use of synthetic oxytocin in labor;

(9) Fetal cranial circumference;

(10) Fetal weight.

3. Results

3.1 Useful Data for Statistical Analysis

In the time period from May to September 2015, 100 women were recruited and 100 PAA were measured ultrasoundally. Not all patients were considered for statistical analysis of the active phase of labor and the expulsive period and were excluded:

- Eight women who performed a caesarean section for reasons not related to mechanical dystocia (non-reassuring cardiotocographic pathology, cervical dystocia, maternal pathology, etc.);
- One woman who performed an operative delivery with a suction cup which, being unique in the whole dataset, could be a disturbing element for the analysis;
- One woman whose fetus was in persistent posterior occipitis (this element has already influenced the duration of labor alone).

Regarding the active phase of labor, in 10 cases it was not possible to establish the beginning as the woman that was already in advanced labor at the time of admission.

For the study on the GPA report with height instead, all women were considered.

Considering what has been said above, the cases useful for the statistical analysis were:

(1) Eighty cases for the active phase of labor;

(2) Ninety cases for the expulsion period;

(3) One hundred cases for the study of relationship between PAA and maternal height.

It has not been possible to carry out a study on the predictability of the delivery method since all the cases considered resulted in a spontaneous delivery.

3.2 Analysis Logic

Both for the study on the active phase and on the expulsion period the following variables were used with the respective abbreviations:

- PAA;
- Minutes of duration of the active phase (min active phase);
- Minutes of expulsion period (min expulsion);
- Maternal height (h_mam);
- Fetal weight (gr_neo);
- Fetal cranial circumference (c_c);
- Use of oxytocin and/or amniorrhexis (oss_amx);
- Equality (parity).

The maternal age variable was not considered in the study because it was homogeneous.

For each possible pair of variables under examination the existence of a direct correlation was evaluated by calculating the correlation coefficient for Spearman ranks. It is a value that can go from -1 to 1.

When the value is negative, a negative correlation between two variables is indicated: as one variable increases, the other decreases. When the value is positive, on the other hand, a positive correlation between two variables is indicated: as one variable increases, the other grows and the other way around.

The more the value approaches the extremes, the stronger is the relationship between the two variables under examination. The value 0 represents the absence of a relationship.

A relationship, to be statistically significant, must have a coefficient greater than/equal to -0.2 when it is a negative correlation and greater than/equal to 0.2 when it comes to a positive correlation.

Subsequently, a factor analysis was performed, represented by the ANOVA tables, on the variables considered most significant, to evaluate the influence they have on the dependent variables at the center of this study: the minutes of the active phase and the minutes of the expulsion period.

3.3 Active Phase

Table 1 shows the correlation coefficients for Sperman ranks of all combinations of possible pairs of the variables considered.

Observing the data we can see that the only pair of variables that has a statistically significant coefficient for the current study is that relative to minutes active phase/oss-amx.

The coefficient is represented by a negative value (-0.264) which represents that the minutes of the active phase decrease if in labor the oxytocin and/or amniorrhexis are/is used.

Since the previous analysis showed no direct correlation between the amplitude of the PAA and the duration of the active phase, a factorial analysis was performed to evaluate the interaction effects that some variables have on the dependent variable: minutes of duration of the phase active.

It was possible to choose to study only three variables at the same time because of the number of available cases, since the quantity of data is too small to be able to investigate the interaction of 4 or more variables at the same time.

By trying to construct an ANOVA with 4 or more variables, there are "holes" in the analysis, not allowing to draw conclusions.

Table 1 Correlation coefficient for Spearman ranks for each possible pair of variables under examination, the statistically significant coefficients are highlighted in yellow.

	Parity	min active phase	h_mam	gr_neo	PAA	c_c	oss-amx
Parity	1.000	-0.182	0.096	0.297	-0.011	0.205	0.012
min active phase	-0.182	1.000	0.029	0.131	0.016	0.196	-0.264
h_mam	0.096	0.029	1.000	0.216	0.436	0.281	-0.084
gr_neo	0.297	0.131	0.216	1.000	0.099	0.603	-0.037
PAA	-0.011	0.016	0.436	0.099	1.000	0.052	-0.127
c_c	0.205	0.196	0.281	0.603	0.052	1.000	-0.100
oss-amx	0.012	-0.264	-0.084	-0.037	-0.127	-0.100	1.000

To perform factor analysis, the following variables were examined: PAA, fetal weight (fgr_neo) and fetal cranial circumference (c_c).

The median of the above variables and the respective standard deviations were calculated:

- Mediana PAA 111.5° ± 5.04°;
- Median fetal weight 3,460 grams ± 426.75 gr;
- Median fetal cranial circumference (c_c) 34.5 cm ± 1.39 cm.

The median has been taken as a reference point to transform the quantitative variables previously listed into two-level categorical variables.

For each variable, level 1 groups the values less than or equal to the median, the level 2 the values above the median (Table 2).

For the factorial analysis an ANOVA was constructed that highlights the effect, single and joint, that the variables PAA, fetal weight (fgr_neo) and fetal cranial circumference (c_c) have on the response variable: minutes of duration of the active phase. The results are shown in Table 3.

When reading a factorial ANOVA table it is fundamental to proceed from the bottom up, as the presence of a significant interaction could make the significance of the main effects unreformative.

The values of the p column represent the probabilities associated with the fact that the null hypothesis H_0 is true, which is that the factor under examination does not produce significant differences on the response variable. The decision rule is:

- if $p < 0.05 \rightarrow$ We reject $H_0 \rightarrow$ The effect is significant;
- if $p > 0.05 \rightarrow$ Accept $H_0 \rightarrow$ The effect is not significant.

As can be seen from the Table 3 we can accept the null hypothesis of all the interactions taken into consideration.

This means that the minutes of the active phase are independent of the amplitude of the PAA, the fetal weight and the measurement of the fetal cranial circumference.

Another ANOVA was constructed to evaluate the effect of the use of oxytocin and/or amniorrhexis. Previous variables were considered, except fetal weight, since previously it was not seen to be involved in the influence of the duration of the active phase. In addition the variable oxytocin and/or amniorrhexis (oss-amx) has been added. The results are reported in Table 3.

Table 2 Representation of the levels of the variables.

LIVEL 1		LIVEL 2
	PAA	
Narrower	<111.5°>	Wider
	Fetal weight	
Smaller	<3,460 g>	Bigger
	Fetal cranial circumference	
Smaller	<34.5 cm>	Bigger

Table 3 Factory ANOVA related to PAA, fetal weight (gr_neo), fetal cranial circumference (c_c), with dependent variable: minutes of duration of the active phase.

	SS	dof	MS	F	p
Intercepts	2,933.108	1	2,933.108	1,966.637	0.000000
PAA	58.754	1	58.754	39.394	0.050978
pos_test	5.336	1	5.336	0.3578	0.551631
c_c	1.182	1	1.182	0.0793	0.779075
PAA*pos_test	32.913	1	32.913	22.068	0.141770
PAA*c_c	40.409	1	40.409	27.094	0.104119
pos_test*c_c	25.230	1	25.230	16.916	0.197531
PAA*pos_test*c_c	12.216	1	12.216	0.8191	0.368462

The only interaction with a value of $p < 0.05$ that allows us to reject the null hypothesis, is the one related to the use of oxytocin and/or amniorrhexis.

Therefore, what emerged was confirmed with the calculation of the correlation coefficient of Spearman, the use of oxytocin and/or amniorrhexis is the only variable that influences the duration of the active phase (Table 4).

3.4 Analysis of the Expulsive Period

As for the active phase also for the study of the expulsion period the correlation coefficients for Spearman ranks of all combinations of possible pairs of the considered variables were calculated. The results are reported in Table 5, which shows that the only variable negatively correlated with the duration of the expulsion period is parity: with the increase of the expulsion period the minutes of the expulsion period decrease.

The effect, single and joint, was assessed that the variables PAA, fetal weight (gr_neo) and fetal cranial circumference (c_c) have on the response variable, duration in minutes of the expulsive period (min expulsion). The results are shown in Table 6.

Table 4 Factorial ANOVA related to PAA, fetal cranial circumference (c_c), use of oxytocin and/or amniorrhexis (oss-amx), with dependent variable: minutes of duration of the active phase.

	SS	dof	MS	F	*p*
Intercepts	3,125.793	1	3,125.793	2,202.677	0.000000
PAA	28.311	1	28.311	19.950	0.162124
oss-amx	65.918	1	65.918	46.451	0.034486
c_c	8.855	1	8.855	0.6240	0.432165
PAA*oss-amx	3.292	1	3.292	0.2320	0.631498
PAA*c_c	22.584	1	22.584	15.914	0.211192
oss-amx*c_c	5.165	1	5.165	0.3640	0.548208
PAA*oss-amx*c_c	43.553	1	43.553	30.691	0.084052

Table 5 Correlation coefficient for Spearman ranks for every possible pair of variables under examination.

	Parity	min expulsive	h_mam	gr_neo	PAA	c_c
Parity	1.000	-0.615	0.089	0.222	-0.044	0.172
min expulsive	-0.615	1.000	0.037	-0.025	-0.111	0.59
h_mam	0.089	-0.037	1.000	0.105	0.359	0.200
gr_neo	0.222	-0.025	0.105	1.000	-0.003	0.565
PAA	-0.044	-0.111	0.359	-0.003	1.000	-0.027
c_c	0.172	0.059	0.200	0.565	-0.027	1.000

Table 6 Factorial ANOVA related to PAA fetal weight, fetal cranial circumference with dependent variable: minutes expulsive period.

	SS	dof	MS	F	P
Intercepts	97,267.71	1	97,267.71	148,064	0.000
gr	174.64	1	174.64	0.266	0.608
APA	1,303.23	1	1,303.23	1.984	0.163
c_c	1,799.18	1	1,799.18	2.739	0.102
gr*PAA	66.20	1	66.20	0.101	0.752
gr*c_c	5.45	1	5.45	0.008	0.928
PAA*c_c	3,266.10	1	3,266.10	4.972	0.028
gr*PAA*c_c	448.57	1	448.57	0.683	0.411
Error	54,525.05	83	656.93		

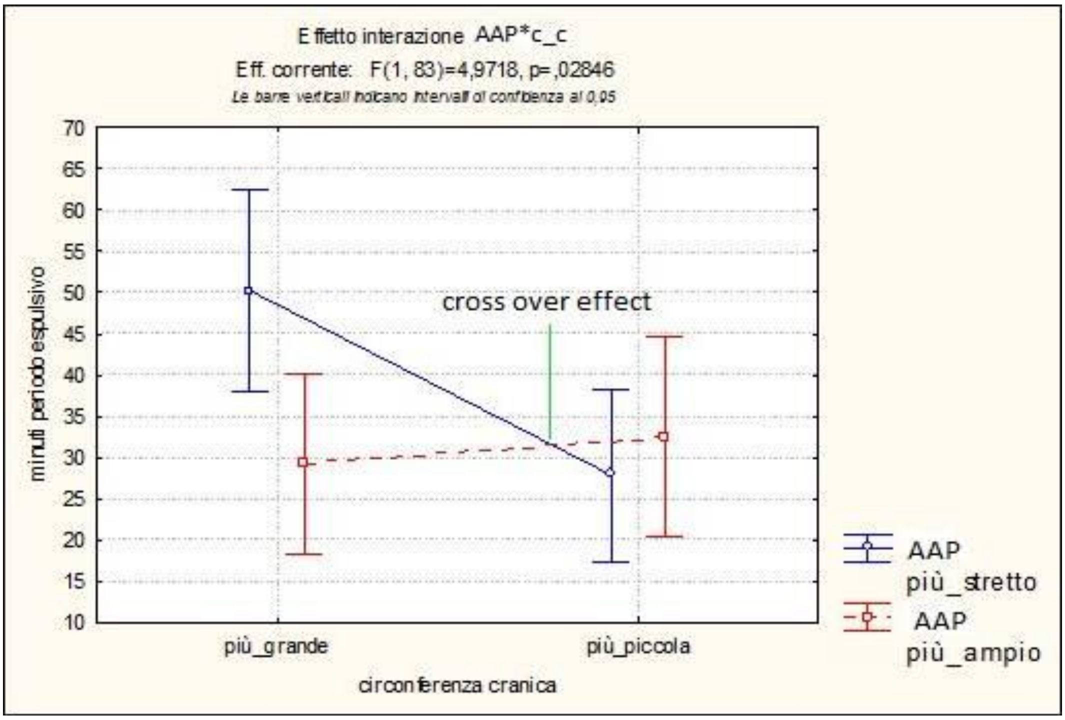

Fig. 2 Representation of how the time of the expulsion period varies according to the width of the pubic bow angle (PAA) and the measurement of the fetal cranial circumference.

The results show that the null hypothesis can be rejected due to the interaction effect of the pair of APA/fetal cranial circumference variables (c_c).

Fig. 2 shows the effect of the interaction of the two variables.

Data for women with a broad PAA are in red, data for women with a narrow PAA are in blu.

On the *X* axis line are the two levels related to the variable fetal cranial circumference (bigger, smaller), on the *Y* axis are the minutes of the expulsion period. Fig. 2 shows that the average duration of the expulsion period is more or less stazionary in women with a broad PAA regardless of the size of the fetal cranial circumference.

Otherwise it happens in the case of a woman with a strict PAA. Infact, if the fetal head circumference is higher than the median (34.5 cm), the average expulsive period is significantly longer than those with a broad PAA, whereas if the fetal head circumference is less than the median, the average duration of the expulsion period is superimposable with that of women with a broad PAA.

Generally, when the lines of the two effects cross (cross-over effect), the effect of one of the factors is modulated or conditioned by the value of the other factor.

So-called "post-hoc comparisons" were performed to evaluate the statistical significance of the differences between pairs of marginal means, obtained by comparing the levels of the first factor (PAA).

For the calculation of the *p*-value associated with the averages, the Bonferrori procedure was used which "corrects" the levels of significance, to take into account the fact that multiple comparisons have been performed.

The results are shown in Table 7: it emerges what is shown in Fig. 2, namely that there is a significant difference in the average duration of the expulsive period when the head circumference of the fetus is larger than average, only if the pubic angle is narrower.

In another ANOVA we considered the effect, single and joint, of the use of oxytocin and/or amniorrhexis whose results are reported in Table 8.

Table 7 Comparison of the average duration of the expulsion period for each pair of possible levels of the variables under examination.

			Medium expulsive period			
Couple	PAA	c_c	{1} 50,091	{2} 28,250	{3} 29,000	{4} 31,609
1	≤ 111.5°	> 34.5 cm		0.0297	0.0465	0.1068
2	≤ 111.5°	≤ 34.5 cm	0.0297		1.0000	1.0000
3	> 111.5°	> 34.5 cm	0.0465	1.0000		1.0000
4	> 111.5°	≤ 34.5 cm	0.1068	1.0000	1.0000	

Table 8 Factorial ANOVA related to PAA, vaiables, fetal cranial circumference (c_c), use of oxytocin and/or amniorrrhexis (oss-amx), with dependent variable: expulsive minutes.

	SS	dof	MS	F	*p*
Intercepts	72,402.51	1	72,402.51	129.3203	0.000000
PAA	1,718.99	1	1,718.99	3.0703	0.083471
c_c	239.98	1	239.98	0.4286	0.514491
oss-amx	188.80	1	188.80	0.3372	0.563034
PAA*cc	143.08	1	143.08	0.2556	0.614549
PAA*oss-amx	251.20	1	251.20	0.4487	0.504848
c_c*oss-amx	1,448.40	1	1448.40	2.5870	0.111586
PAA*c_c*oss-amx	6,986.56	1	6,986.56	12.4789	0.000679
Error	45,909.30	82	559.87		

The results of Table 8 show that we can reject the null hypothesis due to the interaction effect of the PAA variables, fetal cranial circumference and use of oxytocin and/or amniorrhea. In this case too, a graph with a separate representation between the fetuses with small circumference and the fetuses with large circumference (Fig. 3) was constructed to understand the direction of the effect.

On the *X* axis there is the use of oxytocin and/or amniorrhexis (expressed in "yes" and "no"), on the *Y* axis there are the minutes of the expulsion period.

Comparing Fig. 3 with Fig. 2, it can be seen that the use of oxytocin and/or amniorrhexis statistically significantly reduces the minutes of the expulsion period in women with a narrow PAA and a large fetal cranial circumference. In women with a broad PAA, however, regardless of the size of the fetal cranial circumference and in women with a narrow PAA and a small fetal cranial circumference, the use of oxytocin and/or amniorrhexis does not statistically significantly modify the minutes of the expulsion period.

To find out if the ANOVA was performed correctly, the residues were analyzed.

In the graph "Expected values vs. Residuals" (Fig. 4), it is necessary to verify that the red line is aligned with zero (zero average of residuals) and that it is almost horizontal (absence of data drift). Fig. 4 obtained with the data under examination respects these conditions.

3.5 Relationship between Maternal Height and PAA

This study aimed to verify whether there is a direct relationship between the width of the PAA and the height of the woman.

The correlation coefficient for Spearman ranks was then calculated relative to the pair of maternal height variables and PAA which was equal to 0.278.

It can therefore be said that as the maternal height increases, the amplitude of the PAA also tend to increase.

The following chart (Fig. 3) shows the trend line of the increase in PAA compared to height. On the axis of the *X* is the maternal height divided into classes, on the axis of *Y* is the amplitude of the PAA.

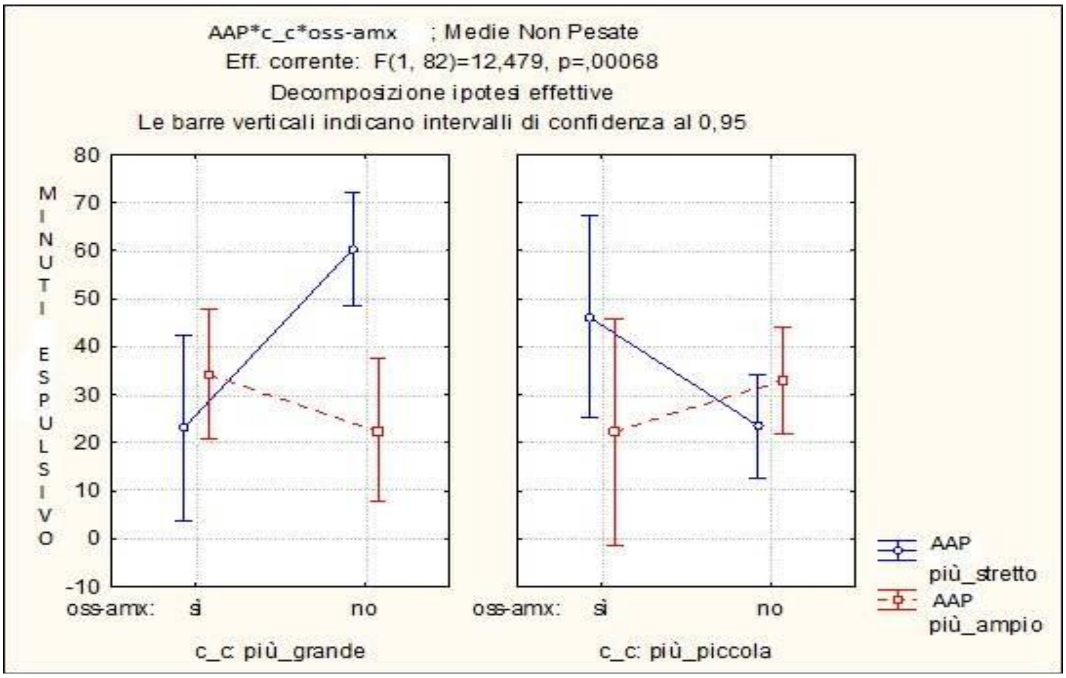

Fig. 3 Representation of the variation of the minutes of the expulsion period with the use of oxytocin and/or amniorrhea based on the amplitude of the PAA and the measurement of the fetal cranial circumference.

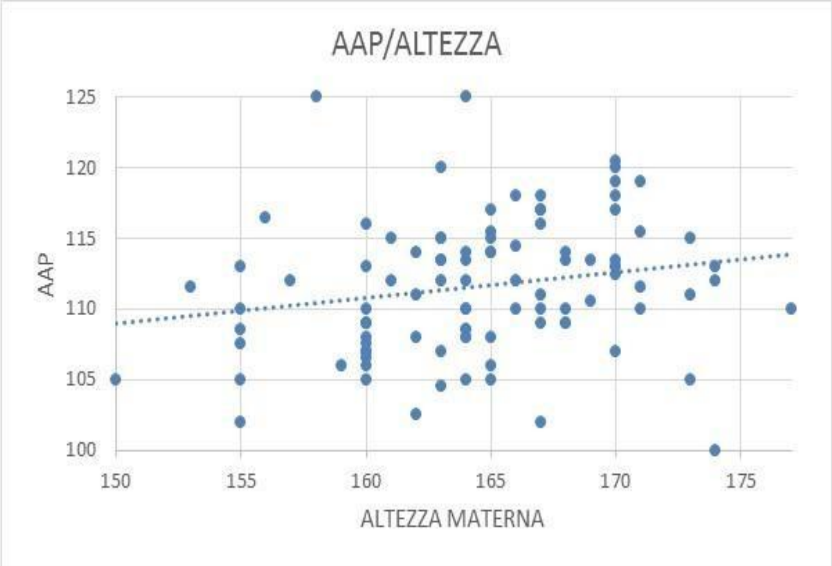

Fig. 4 Representation of the variation in the amplitude of the PAA as the height increases with the respective trend line.

4. Discussion

Considering the results obtained, it can be seen that the duration of the active phase of labor is not influenced by the amplitude of PAA: it depends on intrinsic and extrinsic factors, which do not concern pelvic biometry, such as the use of oxytocin and/or of the amniorrhexis.

In the case of the expulsive period, the results showed a predictability of the PAA on its duration if and only if the measurement of the fetal cranial circumference is taken into consideration.

When the amplitude of the PAA is greater than 111.5°, the head circumference of the fetus does not affect the minutes of expulsion. When it is less than/equal to 111.5°, in front of a cranial circumference of more than 34.5 cm, the expulsion period will be longer, but if it is less than 34.5 cm the expulsion period does not change.

In this sense, the amplitude of the pubic angle moderates or conditions the effect of the fetal cranial circumference.

In this study the fetal cranial circumference was acquired post-birth and in consideration of the fact that it turns out to be a determining value for the prediction of the duration of the expulsion period, it would be useful to verify if its ultrasound measurement is reliable at the end of pregnancy. If so, one would be able to estimate the time of the second stage of labor for each woman before the onset of labor.

With regard to the influence of the PAA on the method of delivery, no analysis was possible because all the selected cases had a vaginal delivery.

However, it should be kept in mind that, during data collection, women with an excessively tight PAA (narrowest angle measured 102°) or fetuses with an excessively large fetal head circumference were found and could therefore constitute an obstacle to natural childbirth.

In order to study the predictability of the PAA calculation on the delivery method, it would be necessary to expand the sample under study, so as to verify if women with an even more narrow PAA have an increased probability of going to an operative birth and if, under a certain degree of amplitude, the PAA alone constitutes the cause for which it is necessary to perform the delivery by caesarean section.

5. Conclusions

Comparing the results obtained from the study with those of Gilboa, it should be noted that the median of the PAA, in the first case (111.5°), is superimposable to the median of the spontaneous parts of the reference study (110.1°).

The difference in results between the two studies lies in the duration of the expulsion period: in that of Gilboa the enlisted women all had a second stage of prolonged labor.

In the study in question, however, with the same amplitude of the PAA, no pregnant woman has gone through an extension of the labor: the patient's management has been strictly active allowing her to take positions more congenial to her, both in the first and in the second stage.

We can then state that, in the case of the Gilboa study of 2013, the extension of the second stage is not attributable to the amplitude of the PAA but it can be hypothesized that it depends on factors such as poor fetal positions, a medicalized management of labor, an incorrect hypokinesia and an unfriendly surrounding environment.

Another difference is the probability of operative birth associated with the PAA calculated in the reference study: it provides for a width of GPA ranging from 125° to 100° a probability of operative birth that varies between 45% and 75%, up to a 100% probability for an PAA amplitude of less than 90°(in the Gilboa study of 2013 there were no spontaneous parts below the 90° amplitude of the PAA).

In this study, however, though all the women have returned to the amplitude range (125°-100°), none of them went to an operative birth or a prolonged expulsion period.

Then it can be inferred that in the study of Gilboa on 2013 a part of the caesarean sections is not attributable to the amplitude of the PAA but from other factors, the same ones that could cause the prolongation of the second stage.

Moreover, the fact that during the data collection did not find an angle less than or equal to the physiological threshold (90°), suggests that it is not a very widespread amplitude in the female population.

In light of what has emerged, it can be deduced that the PAA, calculated in association with the fetal cranial circumference, allows to estimate the duration of the expulsive period of labor, but not the duration of its active phase.

We can also confirm the existence of a direct relationship between the maternal height and the amplitude of the PAA that, although statistically significant, is however rather weak.

In fact for every determined height we can find different values of the PAA and often they deviate very much from the trend line.

Note

The study in question was presented, with partial results, as ABSTRACT at the 13th GIMBE National Conference, Bologna, 02 March 2018 and collected in the ABSTRACT BOOK connected to it.

The complete study was carried out in the absence of any financial contribution. The authors do not present a conflict of interest.

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