Fetal and Neonatal Alloimmune Thrombocytopenia: evidence based screening

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Chapter 8

Women's attitude towards routine HPA-screening in pregnancy

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Abstract

Introduction. Fetal and neonatal alloimmune thrombocytopenia is a potentially life-threatening disease with excellent preventative treatment available for subsequent pregnancies. To prevent index cases, the effectiveness of a population-based screening program has been suggested repeatedly. Therefore, we aimed to evaluate women's attitude towards possible future human platelet antigen-screening in pregnancy.

Material and Methods. We performed a cross-sectional questionnaire study among healthy pregnant women receiving prenatal care in one of seven participating midwifery practices. Attitude was assessed using a questionnaire based on the validated Multidimensional Measurement of Informed Choice model, containing questions assessing knowledge, attitude and intention to participate.

Results. A total of 143 of the 220 women (65%) completed and returned the questionnaire. A positive attitude towards human platelet antigen-screening was expressed by 91% of participants, of which 94% was based on sufficient knowledge. Attitude was more likely to be negatively influenced by the opinion that screening can be frightening. Informed choices were made in 87% and occurred significantly less in women from non-European origin, 89% in European women vs. 60% in non-European women ($p = 0.03$).

Conclusions. Pregnant women in the Netherlands expressed a positive attitude towards human platelet antigen-screening in pregnancy. We therefore expect a high rate of informed uptake when human platelet antigen-screening is implemented. In future counselling on human platelet antigen-screening, ethnicity and possible anxiety associated with screening test need to be specifically addressed.

Introduction

Fetal and neonatal alloimmune thrombocytopenia (FNAIT) is the most important cause of severe thrombocytopenia in term infants, affecting approximately 1 in 700 newborns.[1] As the platelet counterpart of hemolytic disease of fetus and newborn, it is triggered by maternal alloantibodies against incompatible, paternally derived, fetal human platelet antigens (HPA). FNAIT may induce bleeding complications, such as bruising or in severe cases an intracranial hemorrhage as well as massive internal organ bleedings.[2] Unlike for red cell alloimmunization in pregnancy, there is no government-organized population based screening program for FNAIT in the Netherlands. Therefore, FNAIT is usually diagnosed only after the occurrence of fetal or neonatal bleeding complications, or the chance finding of asymptomatic neonatal thrombocytopenia. Fortunately, for subsequent pregnancies there is a highly effective antenatal therapy available, using weekly infusions of immunoglobulins, preventing almost all bleeding complications in following incompatible gestations.[3]

The potential effectiveness of a screening program for FNAIT has been suggested repeatedly.[4,5] Ideally, in order to ascertain its usefulness and validity, population-based screening fulfills the Wilson and Jungner screening criteria.[6] Irreversible brain damage and perinatal death resulting from intracranial bleeding represent a serious health problem, a reliable and acceptable diagnostic test is available and there appears to be an adequate preventive treatment in latent stage. Whereas HPA-1a is the predominant cause of severe FNAIT, screening in studies is focused on identifying HPA-1a alloimmunization, occurring in approximately 1 in 600 pregnancies.[5] Several modeling studies, suggested cost-effectiveness of routine HPA-1a screening.[7,8] The Wilson and Jungner criteria were recently revised, with addition of recognition that a screening program should ensure informed choice and should respond to a recognized need.[9] In general, there is increasing interest in patients' attitudes towards health care, in particular, population-based screening programs.[10-12]

Although many have advocated HPA-screening in pregnancy to prevent FNAIT, no studies evaluating women's attitude towards such a screening program have been performed. Therefore, we performed a cross-sectional questionnaire study among healthy women in the first half of their pregnancy, assessing their attitude towards implementing a nationwide HPA-screening program in pregnancy and their ability to make an informed decision on participating.

Material and methods

From April 2016 through June 2016, women in the first half of their pregnancy, attending one of the seven participating midwifery practices in the Leiden region, were invited to participate. A questionnaire together with an information flyer was provided by their obstetric caregiver (Supplemental material). Women with a limited knowledge of the Dutch language were excluded from participation. After completion, the questionnaires were returned to the Leiden University Medical Center by using provided, pre-paid envelopes. The questionnaire as well as the information flyer were pilot-tested before the study onset.

To test women's attitude towards HPA-screening in pregnancy, the validated Multidimensional Measurement of Informed Choice (MMIC) model developed by Marteau and colleagues was used, which contains three dichotomized elements: knowledge, attitude and uptake.[13-15] Accordingly, an informed choice is based on sufficient knowledge and is value consistent. Value consistency is defined as a behavior that corresponds with the decision maker's attitude, i.e. negative attitude and declining the test or a positive attitude and uptake of the test. Conversely, uninformed choices are either value inconsistent and/or based on insufficient knowledge.

Attitude

The attitude towards HPA-screening was assessed by a 5-point Likert scale adapted from the MMIC model, which consisted of four items (Supplemental table S8.1). The scores ranged from 4 to 20, with a median of 12 to classify women's attitude. Scores higher than 12 indicated a positive attitude and scores equal to or lower than 12 indicated a negative attitude. The four items were sufficiently correlated with a Cronbach's alpha of 0.85.

Knowledge

Whereas no screening program and therefore no information booklets exist yet, an information flyer was established, containing information based on a list of domains of screening, suggested to be essential for informed decision making.[16,17] Knowledge was measured using 14 items, with response options 'correct' and 'incorrect' (supplemental table S8.2). These items were developed and evaluated by experts in obstetrics and gynecology, immunohematology and medical decision making. The items were based on the content covered by the information flyer, divided in three topics: characteristics of FNAIT, characteristics of the screening program, implications of the screening test. The outcomes were dichotomized into either sufficient or insufficient knowledge. Sufficient knowledge was defined as 11 or more questions answered correctly (79%).

Intention to participate

The actual uptake cannot be measured without an implemented screening program. Therefore, we assessed the intention to participate in HPA-screening, instead.

Questions regarding demographic (age, ethnicity, education level and marital status) and obstetric characteristics (parity, previous pregnancies, uptake of other prenatal screening, previous abnormal test results in pregnancy, and intended place of delivery) were included in the questionnaire. Educational level was divided into three levels: 'high' in case of higher vocational or academic degree, 'intermediate' in case of lower vocational or higher secondary school and 'low' in case of lower secondary or primary school. To estimate or define ethnicity, we focused on the geographical land of origin or ancestry, as described previously.[18] Women were defined as European if they themselves and their parents were born in Europe.

Data analysis was conducted in SPSS (version 22.0, SPSS Inc., Chicago, IL, USA). Group differences were tested using Pearson's chi-square test or Fisher's exact test for categorical variables and an unpaired t-test or analysis of variance were used for continuous variables. Potential association between quasi-interval variables (knowledge and attitude) was calculated using Pearson correlation test. To adjust for the influence of one or more continuous variables (educational level, ethnicity), partial correlation was used. Differences with $p < 0.05$ were considered to be statistically significant.

The study proposal was approved by the Ethical Committee of the Leiden University Medical Center in Leiden (reference: P15.351).

Table 8.1 – Participants' characteristics (*n* = 143)

	n	**%**
Age (years)[a]		
< 26	12	8.7
26 – 30	53	38.4
31 – 35	51	37.0
≥ 36	22	15.9
Parity		
Nulliparous	81	57.0
Multiparous	61	43.0
Ethnicity[a]		
European	127	92.0
Non-European	11	8.0
Education level[a]		
High	83	60.1
Intermediate	35	25.4
Low	20	14.5
Religion[a]		
Religious	39	28.3
Not religious	99	71.7

[a] Based on *n* = 138, due to missing data.

Results

During the study period, 220 women were invited to participate and received an information flyer on FNAIT together with a questionnaire form. A total of 143 women returned the questionnaire, a response rate of 65% (Supplemental figure S8.1). There were no characteristics of non-responders available. Participants' characteristics are displayed in Table 8.1. The mean age was 31 years (standard deviation 4.1) and mean gestational age 18.8 weeks (standard deviation 5.9). Of the 81 nulliparous women, 59 women reported to be pregnant for the first time (42%). The majority of the participants was highly educated (60%). The intended place of delivery was at home for 21%. Non-European origin included Aruba, Azerbaijan, Curacao, Ecuador, New Zealand and Russia once, Morocco twice and Turkey in three cases.

Attitude

The attitude towards future HPA-screening was positive in 124/137 cases (91%). This positive perspective was founded on sufficient knowledge in 116 out of 124 cases (one missing value). The item for measuring attitude that received the lowest scores was whether or not the screening was thought to be reassuring (Figure 8.1); for the other items, scores were comparable.

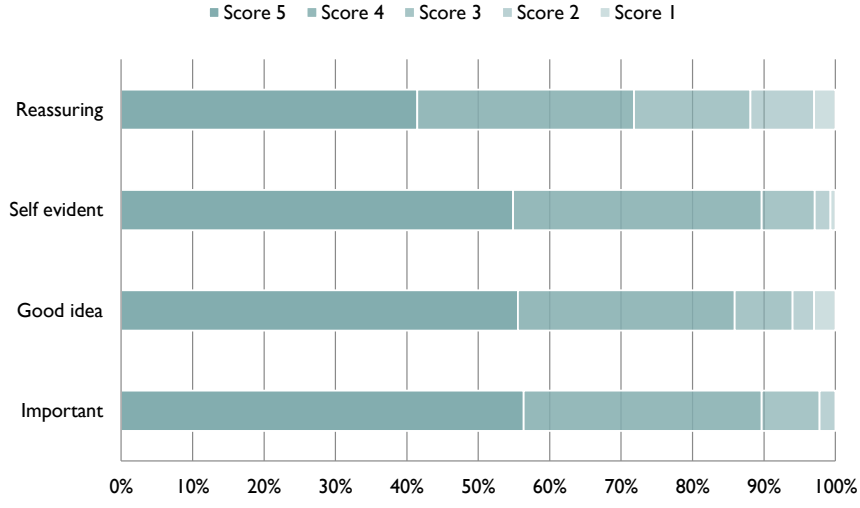

Figure 8.1 – Attitude scores towards human platelet antigen-screening in pregnancy

Thirteen women expressed a negative attitude towards future HPA-screening, in 11/13 cases based on sufficient knowledge, but all resulted in a willingness to participate in HPA-screening and thus representing value inconsistency. Characteristics of these women did not statistically differ from the whole study population, except for the intended location of birth. Women who intended to deliver at home were less frequently positive towards screening than women who planned to give birth in a hospital or birth hotel (81% vs 95%, $p = 0.02$). Of these negative attitudes ($n = 5$), one was based on insufficient knowledge, one was value consistent and declined screening, and the other three resulted in an intention to participate.

Knowledge

Overall, 93% of all participants were scored to have sufficient knowledge. None of the 10 women with more than three of the 14 questions answered incorrectly, would decline participating in future HPA-screening. Of these, six had a high educational level, four were nulliparous and six were religious. Rate of sufficient knowledge or mean knowledge scores did not differ significantly for ethnicity, educational level, parity or religion (Table 8.2).

Table 8.2 – Association between ethnicity/educational level and attitude and informed choice

	Sufficient knowledge		Positive attitude		Value consistent		Informed choice	
	n/N	%	*n*/N	%	*n*/N	%	*n*/N	%
Total	129/139	93	124/137	91	127/137	93	118/136	87
Educational level								
High	77/83	93	71/82	87	73/81	90	68/81	84
Intermediate	33/35	94	34/35	97	34/35	97	32/35	91
Low	17/19	90	18/19	95	18/19	95	16/18	89
Ethnicity								
European	119/127	94	114/125	91	116/124	94	110/124	89[a]
Non-European	8/10	80	9/11	82	9/11	82	6/10	60[a]

N, total number, [a]$p = 0.03$.

Intention to participate

Two women (2%) who returned the questionnaire had no intention to participate in possible HPA-screening in pregnancy, both were informed choices and both women were highly educated.

Informed choice

An informed choice was made by 118 of 136 participants (87%), of which 116 were informed choices with the intention to participate (Table 8.3). In the remaining 18 cases there was no informed choice because of insufficient knowledge ($n = 10$) or due to value inconsistency ($n = 8$). A significantly lower rate of informed choices was found in non-European women, with 60% making an informed choice vs. 89% ($p = 0.03$) in the European population (Table 8.2).

There was no correlation between knowledge scores and total attitude scores ($r = 0.10$, $p = 0.23$). Also, knowledge scores had no influence on the subscale score regardless of whether the test was perceived as reassuring ($r = 0.07$, p = 0.39). Correcting for educational level had very little influence on these correlations (attitude $r = 0.13$ $p = 0.12$; reassuring $r = 0.07$, $p = 0.40$).

Table 8.3 – Informed choice. Intention to participate in human platelet antigen-screening

	Yes	No	Total
Sufficient knowledge, positive attitude	116	0	116
Insufficient knowledge, positive attitude	8	0	8
Sufficient knowledge, negative attitude	8	2	10
Insufficient knowledge, negative attitude	2	0	2
Total	134	2	136

Discussion

In addition to the actual and ongoing debate on implementing HPA-screening in order to prevent the high morbidity and mortality caused by FNAIT, this is the first study assessing women's attitude towards such a screening program. Women's attitude towards HPA-screening in pregnancy was overall very positive, with 91% of all participants expressing a positive opinion. In 94% of these cases, positive attitude was based on sufficient knowledge, all resulting in the intention to participate in such a screening program. Less positive attitude scores were mainly obtained on the item 'reassuring', indicating that women are most concerned that HPA-screening could lead to anxiety during their pregnancy. The potential to cause anxiety need to be carefully considered in designing an HPA-screening program.

Almost all participants indicated they would participate in a HPA-screening program. However, not all of these choices were based on an informed choice. The choices for participation not based on informed choice were equally due to value-inconsistent choices as well as decisions based on insufficient knowledge. Compared to the composition of the whole study population, a higher proportion of uninformed decisions was made by women of non-European origin (22%

vs. 8%), again equally explained by value inconsistency and insufficient knowledge. Although the actual number of non-European pregnant women in the study was low, this was still a significant difference. In a future screening program, information needs to be adapted to the pregnant women's background and language.

The proportion of highly educated women in our study population (60%) was somewhat greater compared to the 48% in the general 25-45 year-old Dutch female population.[19] This could introduce bias in our results. However, since knowledge did not differ significantly between education groups and it was not correlated with attitude scores, we regard this overrepresentation of highly educated women as having no effect on our results and conclusions. In addition, due to the slightly less positive attitude towards screening in the highly educated women, if this overrepresentation of highly educated women would have had any influence on our results at all, it would be an underestimation of the positivity of women's attitude towards HPA-screening.

To estimate the third topic, 'uptake', of the validated MMIC model, 'intention to participate' was used as a surrogate measurement. Although this calculation is used by various studies to predict actual uptake of a test, we cannot as yet verify the strength of this prediction.[20,21]

Another limitation worth mentioning is the underrepresentation of non-Dutch or non-European participants due to the fact that only a Dutch information flyer was constructed and therefore women that were not able to read and understand the Dutch language had to be excluded from participation in our study. Possibly, this might contribute to an overestimation of the overall rate of informed choices made, which of course, in case of future screening, can be avoided by for example providing multilingual information flyers.

Strengths of our study were its careful design, using a validated model for assessing attitude and measuring informed choice. The response rate of our study was relatively higher than other questionnaire studies assessing patient's attitude towards population based screening.[10,12,20,22-24] The scale for measuring attitude had a high reliability and was sufficiently internal consistent, with a Cronbach's alpha of 0.85.

Pregnant women, informed using a carefully designed flyer, appeared to accept and welcome a general screening program for HPA-immunization. Higher knowledge scores did not have any effect on overall attitude scores or to the extent to which HPA-screening was regarded as reassuring. This is in line with previous studies reporting no association between a higher knowledge of a screening test and increased anxiety.[20,23,25] Knowledge questions that were more likely to be answered incorrectly were the questions regarding the implication of screening results. Basic clinical and procedural aspects of FNAIT screening were answered best.

This study confirms the importance of adapting counseling to women's ethnicity and educational level, especially as a non-European origin seemed to correlate with a decreased ability to make an informed decision.[24] Also, the main factor contributing negatively to the overall attitude is whether a future HPA-screening would be reassuring, which stipulates other aspects to be taken into consideration when informing and counseling pregnant women.[20] This is in line with the results from a review of 34 original studies on prenatal screening tests performed by Dahl *et al*[26], who concluded that the second most important reason for declining a screening test was its potential to cause anxiety and uncertainty.

Not every disease will be suitable for population-based screening, and before implementing such a program, predefined criteria have to be fulfilled.[6] In addition to Killie *et al*[7] speculating the cost-effectiveness, Tiller *et al*[27] as well as Kamphuis *et al*[5] advocating the importance of the health problem, the availability of a rapid and reliable screening test[28] and the current development of international treatment guidelines, our study shows fulfillment of yet another criterion of Wilson and Jungner – the acceptability of the screening to the population. Nonetheless, before proceeding to making a decision on implementing HPA-screening, additional research, focused on the natural history of FNAIT and the consequences of positive screening results, needs to be conducted. Prospective pilot screening studies should allow the identification of factors predicting high risk pregnancies that would benefit from treatment and would enable a more detailed economic analysis.

In summary, our study shows that with adequate provision of information, pregnant women are positive towards an HPA-screening program and are capable of making an informed choice on participating in such a program. Additionally, our study identifies important focus points to be taking into account when informing and counseling pregnant women. Implementation of HPA-screening in pregnancy in order to prevent FNAIT appears to be acceptable to the target screening population of pregnant women.

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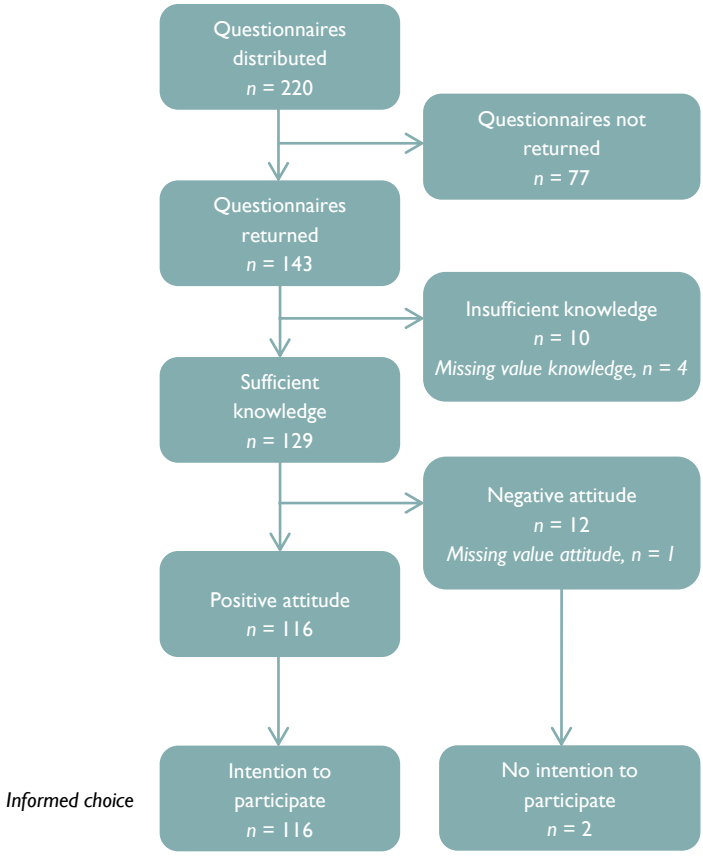
Supplemental material



Supplemental figure S8.1 – Flowchart of study response and informed decision making

Supplemental table S8.1 – Attitude measurement

For me, future HPA-screening would be …						
Unimportant	1	2	3	4	5	Important
Bad idea	1	2	3	4	5	Good idea
Useless	1	2	3	4	5	Beneficial
Frightening	1	2	3	4	5	Reassuring

HPA, human platelet antigen.

Supplemental table S8.2 – Knowledge measurement

Clinical aspects of FNAIT	**Correct**	**Incorrect**
Pathophysiology of FNAIT resembles that of Rhesus disease	O	O
In FNAIT the mother gets clinically ill	O	O
An intracranial hemorrhage is a severe symptom of FNAIT	O	O
Bleeding problems occur in every case of FNAIT	O	O
Diagnosis of FNAIT and HPA-screening	**Correct**	**Incorrect**
Diagnosis is often too late	O	O
Potential future HPA-screening will be applied postnatal	O	O
Screening can be performed by assessing mother's blood	O	O
Screening will detect all cases of FNAIT	O	O
A positive screening result indicates the baby will always suffer bleeding complications	O	O
One in 10 pregnant women will be screen-positive	O	O
Treatment of FNAIT	**Correct**	**Incorrect**
There is no preventative treatment available for FNAIT	O	O
Pregnant women need to be sedated before treatment	O	O
Treatment can be applied during pregnancy	O	O
With treatment, intracranial hemorrhages can be prevented	O	O

HPA, human platelet antigen; FNAIT, fetal and neonatal alloimmune thrombocytopenia.

Supplemental Questionnaire

Leids Universitair Medisch Centrum

Congratulations with your pregnancy!

We want to ask you to participate in a questionnaire study that focuses on screening for antibodies against platelets in pregnancy. Filling in the questionnaire will take about **5-8 minutes.**

We are very interested in **your opinion** about a potential new screening program during pregnancy. Attached you will find a flyer with information about antibodies against platelets in pregnancy. Please, read this flyer carefully.

Participation is completely voluntary. If the questionnaire is completed, it can be turned in at you midwife or send to us in the supplied envelope (free of costs). The questionnaire consists of a total of 25 questions. All results will be processed anonymously.

For questions or the need for more information, please contact: mailto:r.m.loeff@lumc.nl

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drs. D. Winkelhorst, medical doctor LUMC
prof. dr. D. Oepkes, gynecologist LUMC

GENERAL

1. What is your age?

……. years

2. What is your highest completed education?

o Higher vocational / Academic
o Lower vocational / Higher secondary school
o Lower secondary school / Primary school / none

3. What is your relationship to the father of your baby?

o Married / Living together
o Not living together, in relationship
o Not living together, no relationship

4. What is the land of birth of you, your parents, your potential partner and his/her parents?

Land of birth - you	……	Land of birth – your partner	……
Land of birth – your father	……	Land of birth – your partner's father	……
Land of birth – your mother	……	Land of birth – your partner's mother	……

5. Are you and your partner religious?
If so, please specify:

	You	**Your Partner**
None	o	o
Catholic	o	o
Protestant	o	o
Islamic	o	o
Hindoeïstic	o	o
Other, ……	o	o

ABOUT THIS PREGNANCY AND EARLIER PREGNANCIES

6. How many weeks are you pregnant?

…… weeks and ….. days

7. Who is your primary obstetric caregiver?

o midwife
o gynecologist
o general practitioner

8. Where do you intend to deliver?

o Home
o Hospital
o Birth clinic
o I don't know

9. Have you been pregnant or gave birth before?

This includes miscarriages.

o yes (go to question 10) o no (go to question 12)

10. Have you had a miscarriage before?

o yes (go to question 11) o no

…… miscarriage

11. How many times have you delivered before?

A delivery is called a delivery from 16 weeks gestational age onwards.
A delivery of twins counts as one delivery.

…… deliveries

12. Did you ever have an abnormal test result during pregnancy?

o yes o no

If so, please specify:

……
……
……
……

KNOWLEDGE - FETAL AND NEONATAL ALLOIMMUNE THROMBOCYTOPENIA (FNAIT)

We would like to ask you to read the flyer with background information. Below, you can find a couple of statements, please state if you agree or disagree with these statements.

13. Pathophysiology

	Agree	Disagree
FNAIT resembles Rhesus disease	O	O
FNAIT is caused by a difference in blood type between father and child	O	O
FNAIT causes illness in the mother	O	O
A intracranial hemorrhage is a severe symptom of FNAIT	O	O
All children with FNAIT will suffer from a hemorrhage	O	O

14. Diagnosis and screening

	Agree	Disagree
The diagnosis FNAIT is often made too late	O	O
Screening for FNAIT will take place after birth	O	O
Screening is possible with a blood test in mother	O	O
Screening will detect all cases of FNAIT	O	O
A positive screenings result always results in disease in the child	O	O
1 in 10 women has a positive screenings result	O	O

15. Treatment

	Agree	Disagree
There is no preventive treatment for FNAIT	O	
For preventive treatment mother needs to be sedated	O	O
Preventive treatment can take place during pregnancy	O	O
With preventive treatment during pregnancy intracranial hemorrhages can be prevented	O	O

YOUR OPINION ON THE FLYER

We would very much like to know what your opinion on our flyer is.
For example: If you think the flyer is very clear, please encircle '5'
If you think the flyer is somewhat unclear, please encircle '2'.

16. The flyer supplies on screening for antibodies against platelets in pregnancy and FNAIT was:

Unclear	1	2	3	4	5	**Clear**

17. Would you have wanted more information on screening to timely detect FNAIT?

- o No
- o Yes, I would have likes some more information:
- o more information on paper
- o more spoken information from my obstetric caregiver
- o through a special telephone number
- o other .....

18. Please specify below the kind of information that your missed in our flyer or the information that was unclear

.....
.....
.....
.....

ATTITUDE

Please let us know what your opinion is on a potential screening program to timely detect FNAIT. Please encircle the number that best fits your opinion.

For example: *If you think screening is very important, please encircle '5'.*
If you think screening is absolutely not important, please encircle '1'.

19. In my opinion, screening for FNAIT during pregnancy is:

Unimportant	1	2	3	4	5	**Important**
Bad idea	1	2	3	4	5	**Good idea**
Useless	1	2	3	4	5	**Beneficial**
Frightening	1	2	3	4	5	**Reassuring**

20. Would you participate in a potential screening program for FNAIT:

	Yes	**No**
I would participate in a screening program for FNAIT	O	O

21. If you want to elaborate on questions 19 and 20, please do so below:

.....
.....
.....
.....

PARTICIPATION IN CURRENT SCREENING PROGRAMS

With the following questions we would like to know your opinion and participation in current national screening programs in the Netherlands.

22. Did you know participation in screening programs is voluntary?

o Yes, I knew
o No, I did not know

23. Did you know that the blood testing for antibodies against red blood cells and infectious diseases in the first trimester of your pregnancy is part of a screening program?

o Yes, I knew
o No, I did not know

24. Did you participate in this screening program?

o Yes
o No
o Not applicable: no blood test is performed yet

25. Did you participate during previous pregnancies?

o Yes
o No
o Not applicable: this is my first pregnancy