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## Facilitators and barriers for RhD-immunized women to become and remain anti-D donors

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**BACKGROUND:** The successful introduction of prophylaxis with anti-RhD immunoglobulin has resulted in a significant decline of pregnancy-related RhD immunizations but also has decreased the availability of naturally immunized women as (new) anti-D donors. An influx of new donors is necessary to maintain a sufficient pool of anti-D donors. We investigated motivators, barriers, and predictors for anti-D donorship in RhD-immunized women.

**STUDY DESIGN AND METHODS:** A mixed-methods design was applied, including focus group discussions and questionnaires. Two focus groups (including 11 women) served as input for the questionnaire.

**RESULTS:** In total, 47.6% of 750 anti-D donors and potential donors completed the questionnaire (50.4% donors; 38% nondonors; 11.6% former donors). Almost 70% of the nondonors would have become donors if they had known about the possibility. Travel time investment was reported as a disadvantage; one-half of donors mentioned no disadvantages. Motivators for anti-D donorship were “doing something in return” (31.2%) and “preventing others having a sick child or losing a child” (33.9%). In multivariable analysis, living single (odds ratio, 5.8;  $p = 0.02$ ) and living partnered without resident children (odds ratio, 7.9;  $p = 0.03$ ), compared with living partnered with children, were predictors for anti-D donorship. Not being registered as an organ donor (odds ratio, 0.25;  $p < 0.001$ ) predicted that the individual would not be an anti-D donor.

**CONCLUSION:** The main barrier for anti-D donorship was a lack of knowledge. Positive predictors of anti-D donorship were living without resident children, altruism, and being registered as an organ donor. A blood bank should develop targeted recruitment strategies with a focus on spreading knowledge about anti-D donorship among RhD-immunized women.

Before the introduction of anti-D immunoprophylaxis, RhD immunization was a major cause of perinatal death.<sup>1-3</sup> Since the 1960s, RhD-negative pregnant women in developed countries have received anti-D immunoglobulin (anti-D) within 48 hours after delivery or in situations during pregnancy that create a risk of fetomaternal hemorrhage.<sup>4</sup> In the Netherlands, postnatal anti-D prophylaxis was introduced in 1969.<sup>5</sup> Routine antenatal anti-D prophylaxis in the 30th week was introduced in 1998. From 2011 onward, fetal RhD genotyping in maternal plasma has been performed first, restricting prophylaxis to pregnant women with an RhD-positive fetus.<sup>6,7</sup> Together, these preventive measures have substantially reduced the risk of RhD

**ABBREVIATIONS:** HDFN = hemolytic disease of the fetus and newborn; LUMC = Leiden University Medical Center.

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alloimmunization and subsequent hemolytic disease of the fetus and newborn (HDFN). HDFN is known as Rhesus disease in the Netherlands. Currently, the estimated number of newly immunized women in the Netherlands is approximately 50 per year (data from registration of alloimmunized pregnancies at Sanquin Diagnostic Services; national reference center).

To safeguard the anti-D prophylaxis program in the Netherlands, anti-D immunoglobulins are partly obtained from the plasma of RhD-immunized donors and partly imported from abroad.<sup>8</sup> In the Netherlands, most anti-D donors are RhD-negative women between ages 45 and 70 years who are immunized naturally after pregnancy and delivery of an RhD-positive child.<sup>9</sup> Some (both male and female) donors are intentionally immunized by administering a small amount of RhD-positive red blood cells. To meet the national demand for anti-D prophylaxis, approximately 32,000 vials are needed, corresponding to 3200 donations per year (one donation is sufficient for 10 products).<sup>10</sup> Assuming an average of 5 donations per donor per year, 640 donors would be required to reach self-sufficiency in the Netherlands.<sup>9,11</sup> However, the group of active anti-D donors has decreased over the last years from 501 in December 2010 to 406 in December 2015, because the dropout of donors exceeds the influx of new donors as a negative result of the successful prophylaxis program. An important dropout reason concerns anti-D donors who were immunized by a pregnancy and delivery before the introduction of anti-D prophylaxis in 1969 and have reached the maximum age for donation of 70 years. The proportion of older age donors who stopped reached its peak in 2014 and is now stabilized at 2% to 7% annually.<sup>9</sup> As fewer women are newly immunized by pregnancy and delivery, it becomes more important to recruit a higher proportion of newly immunized or already immunized women to become anti-D donors in order to increase and stabilize the donor population.

Recruiting naturally immunized women has some advantages compared with intentionally immunized men. First, recruiting naturally immunized women prevents future problems in intentionally immunized donors when they need a transfusion themselves. The presence of RhD antibodies can delay the process of preparing suitable donor blood, especially when people are traveling to Asia, where there are fewer RhD-negative individuals than in Western countries.<sup>12</sup> Second, voluntary unpaid blood donation is recommended by all international authorities (World Health Organization/Council of Europe/International Society of Blood Transfusion/European Blood Alliance), because it is the best way to strive for self-sufficiency in blood products of all kinds while maintaining an optimal level of quality and safety for both recipients and donors.<sup>13-15</sup>

Although much is known about the behavior and motivations of whole blood donors,<sup>16</sup> less research has

been focused on the motivational and psychological factors associated with plasma donor behavior.<sup>17</sup> In the specific group of anti-D plasma donors, to the best of our knowledge, no research has been performed. Factors that play a role in the intention to donate whole blood are educational level, age, sex, and marital status.<sup>18</sup> Several studies have pinpointed motivators that are associated positively with becoming and remaining a donor. These factors include a positive attitude toward donating blood, social pressure to donate, perceived behavioral control or self-efficacy, the importance of being a blood donor, altruism, and feeling an obligation.<sup>16</sup> In addition, donor career influences return behavior: the longer donors actively remain donating, the more likely they become committed donors.<sup>19</sup> Between whole blood donors and plasma donors, few recognizable differences exist. Plasma donors have higher donation intention, self-efficacy, attitude, and conscientiousness and lower anxiety than whole blood donors.<sup>17</sup> It is not unlikely that anti-D donors also may differ in some ways from whole blood and nonspecific plasma donors. They emerge from a special group of women who potentially have experienced severe disease of their unborn or newborn child or maybe even loss of a child through HDFN. These confrontational memories might influence (both positively and negatively) their intention to donate.

Based on knowledge about RhD-immunized women and their considerations to donate anti-D, targeted recruitment strategies and retention interventions could be developed to guarantee a continuous supply of anti-D plasma from voluntary, immunized, unpaid donors in the Netherlands. To this end, we investigated motivators, barriers, and predictors, and appreciated recruitment strategies for anti-D donorship in RhD-immunized women who are potentially eligible to become an anti-D donor.

## MATERIALS AND METHODS

### Design

We applied a mixed-methods study design, combining qualitative and quantitative approaches. Qualitative data were collected by means of focus groups, and quantitative data were gathered using a questionnaire. The main objective of the qualitative approach was to identify key themes central to motivations and barriers of (potential) anti-D donors, serving as input for the development of a quantitative questionnaire. We chose to use focus group discussions so that the effect of mutual interaction on the motivation for anti-D donorship and the relation with experiences and preferences could be more easily identified. This study was part of a larger project to gain more insight into the willingness of obstetric care providers to play a role in the recruitment of new anti-D donors. The opinion of obstetric care providers will be elaborated in

another report. The Medical Advisory Council of the Leiden University Medical Center (LUMC) approved the study.

### Participants

Participants were anti-D donors and potential new anti-D donors (i.e., naturally RhD-immunized women) between ages 43 and 65 years. Age limits were defined based on the ability to be hyperimmunized (after 45 years) and the age limit for donating (70 years). Participants were selected from the database of anti-D donors at the Sanquin Department of Donor Relations and from the database of the LUMC, which was the reference center for the management and treatment of pregnancies with severe RhD immunizations in the Netherlands.

For the focus group discussions, 100 RhD-immunized women were selected from the LUMC database. These were the patients seen most recently at the LUMC mixed with some older women from their neighborhood. They received an invitational letter and an informed consent form from the obstetric care providers at the LUMC. Consenting women were contacted to make an appointment for the focus group discussion by the first author. The focus groups were put together using purposive sampling. In each focus group, active and potential anti-D donors were included, and variations in age and severity of offspring HDFN were pursued. The groups consisted of four to seven women and were organized (if possible) in the neighborhood of the participants. Focus groups were organized until data saturation was achieved.

For the questionnaire, RhD-immunized women from the LUMC database received a letter on behalf of their obstetric care provider with a link to the online questionnaire. Current anti-D donors were approached by the Sanquin Department of Donor Relations via email.

### Data-collection procedure

#### *Focus groups*

We conducted two focus group discussions. A skilled moderator guided the participants through an open discussion, stimulating and influencing their thinking to finally generate a maximum number of different ideas and opinions. The discussion was structured around a set of carefully predetermined open questions (Appendix S1, available as supporting information in the online version of this paper) based on evidence about donor motivation and was fueled by the researchers' expertise on the topics of blood donor behavior, RhD immunization, and the problems of HDFN. The moderator ended the discussion when new ideas and opinions were no longer put forward. The discussion was video recorded, and notes were taken. Each focus group session was transcribed verbatim, also including relevant nonverbal cues. After the first focus group, the verbatim protocol was analyzed to identify

central topics to be discussed in subsequent sessions. Participants in the focus groups were offered travel expense refunds and a small gift.

#### *Questionnaire*

Based on the core themes identified in the focus groups (also including the motivators and barriers mentioned), the questionnaire was developed. Specific questions on motivation and donation barriers for (potential) anti-D donors also were included.

The dependent variable was anti-D donor status, asked as: "Are you currently an anti-D donor?" (yes/no/past donor).

#### *Independent variables*

**Obstetric medical history.** Questions about obstetric medical history included pregnancies (yes/no, number, year of last pregnancy), spontaneous/induced abortions (less than 16 weeks, number), and the severity of HDFN per pregnancy (yes/no perinatal death due to HDFN, prenatal and/or postnatal transfusion, exchange transfusion, phototherapy). The severity of HDFN was classified into four categories based on the most severe HDFN the women experienced during one or more pregnancies; 1, fetal demise; 2, prenatal fetal transfusion; 3, postnatal neonatal (exchange) transfusion; and 4, neonatal phototherapy.

**Knowledge about/attitudes toward anti-D donorship.** Questions regarding knowledge about and attitudes toward anti-D donorship included the following: "Do you know what an anti-D injection is and what it is for?" "have you ever heard about anti-D donorship?" (yes/no; string value for explanation in own words); and (for donors) "how did you come up with the idea to become anti-D donor?" Motivators included, "I want to do something in return"; "it does not cost me much trouble, and it delivers much"; "I want to prevent others having a sick child or losing a child"; "anti-D donors are needed"; "other" (yes/no/string value for explanation in own words); and "the most important value to become an anti-D donor" (above-mentioned categories; single answer). Negative factors included "time," "travel time," "travel cost," "health," and "confrontations with memories of HDFN," "negative experience of blood donation," "fear of needles," "no negative factors," and "other" (yes/no/string value for explanation in own words). Recruitment factors included the "mode of recruitment" (social media, magazines, newspapers, door-to-door flyers, obstetric care provider/other health care provider, obstetric care provider at LUMC, other blood donors) and "timing of contact" (during pregnancy, short time after delivery, 6 weeks after delivery, 6 months after delivery, a few years after delivery, approximately \_ years).

**Demographics.** We included a set of standardized measures from the Donor InSight Study.<sup>10</sup> The questions concerned age (years), postal code (to check for double

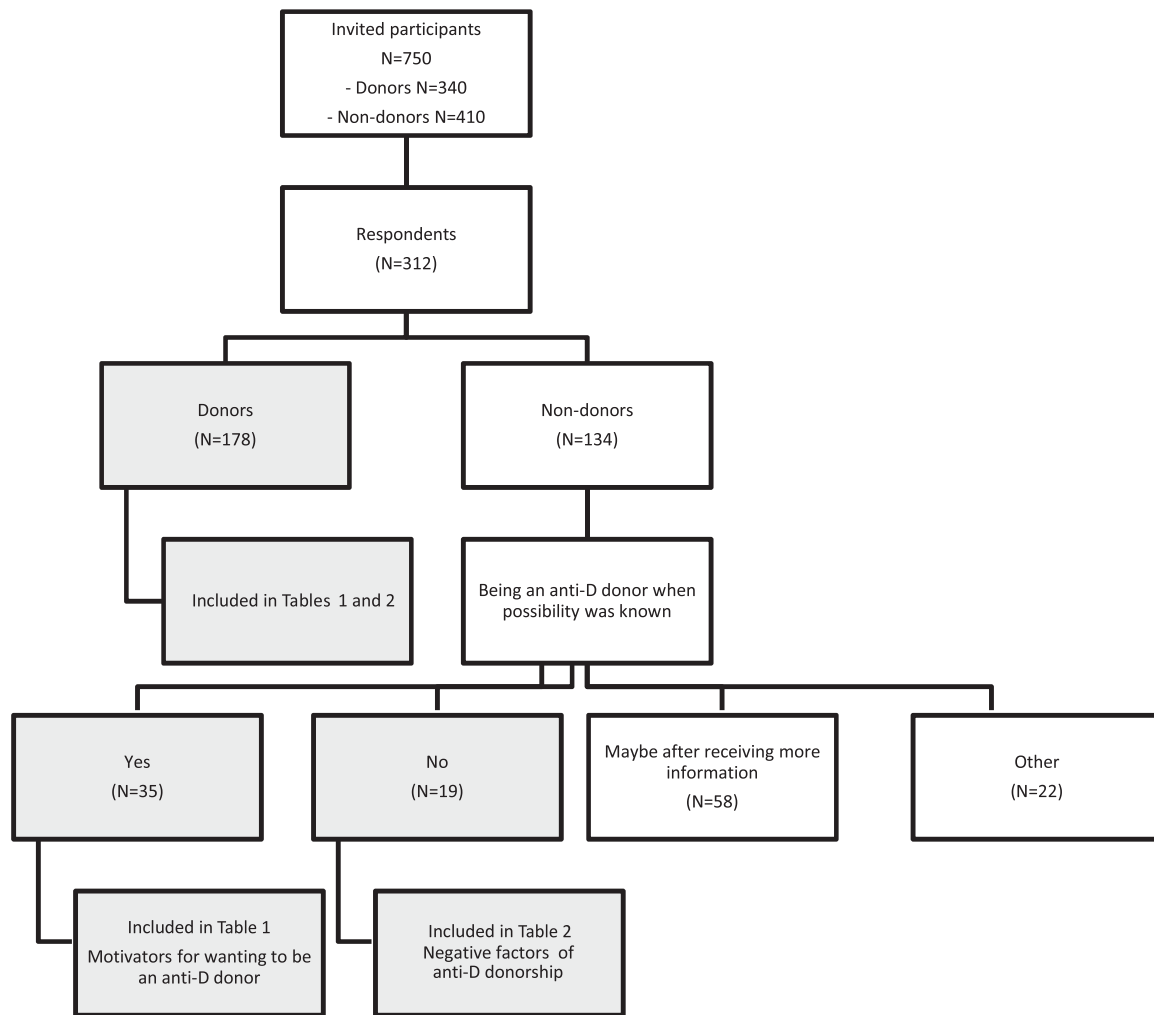


Fig. 1. This is a flowchart of the participants who are included in Tables 1 and 2.

responses), ethnicity, religion, level of education, working status, family income, and family situation (marital status, family composition). Answering categories and descriptive statistics are presented in Table 3.

**Prosocial values and behavior.** We included questions concerning being a registered organ donor (yes/no/choice to relatives) and volunteer work (yes/no). We measured prosocial value orientation differentiated by three scales (with answer categories on a 5-point Likert scale, from “totally agree” to “totally disagree”); sum scores were calculated. The first scale, “trust,” comprised two items referring to generalized social trust (maximal total score = 10) included in the statements developed by Rosenberg.<sup>20</sup> The second scale, “altruism,” comprised five items (maximal total score = 25) referring to altruism that were developed by Gordon and translated into Dutch by Drenth and Kranendonk.<sup>21,22</sup> The third scale, “empathic concern,” comprised four items (maximal total score = 20) referring to empathy that were developed by Davis and modified by Bekkers.<sup>23,24</sup>

## Analysis

Qualitative data were analyzed using thematic content analysis.<sup>25</sup> Coding schemes identifying key categories in facilitators and barriers were revised and expanded, resulting in core themes.

We described the attitude towards anti-D donorship in terms of motivators and negative factors of anti-D donorship. Motivators were mentioned by anti-D donors as well as nondonors who indicated the intention to become donors. Negative factors were mentioned by anti-D donors and nondonors who were unwilling to become donors.

For analysis of the quantitative data, we compared motivators and barriers and potential predictors for anti-D donorship between current donors and nondonors, disregarding women who were currently not anti-D donors but had been in the past.

Dichotomous outcomes were described as numbers and percentages, normally distributed continuous variables were described as means and standard deviations,

**TABLE 1. Motivators for being or becoming an anti-D donor**

Motivator*	No. (%)	
	Anti-D donor, N = 178	Nondonor, N = 35†
"I want to do something in return"	84 (47.8)	22 (62.9)
"It does not cost me much trouble, and it delivers much"	108 (60.6)	21 (60.0)
"I want to prevent others having a sick child or losing a child"	82 (45.6)	21 (60.0)
"Anti-D donors are needed"	150 (83.9)	16 (45.7)

\* Multiple answers were possible.  
† These were nondonors with the intention to become a donor.

and non-normally distributed continuous variables were expressed as median and P25 to P75 values. Differences between nondonors and current donors were tested univariably by means of the Pearson chi-square test (dichotomous variables), the t test (normally distributed, continuous variables), or the Mann-Whitney U test (not normally distributed continuous variables). All variables with a p value less than 0.20 were included in a multivariable logistic regression analysis to estimate the associations between potential predictors and anti-D donorship. The strengths of the associations were expressed as odds ratios and their corresponding 95% confidence intervals. Age (continuous) was included in the model as a potential confounder. Variables with a significant ( $p < 0.05$ ) association in the regression analysis were included in a prediction model that predicted anti-D donorship. Data were analyzed using SPSS Statistics version 23 (SPSS, Inc.).

## RESULTS

### Results from the qualitative focus group interviews

Of 100 RhD-immunized women who were invited for the focus group discussions, about 1 in 5 was an anti-D donor. Twenty-four women gave consent to participate in a focus group. After two focus groups, which included a total of 11 women, data saturation was achieved. The remaining 13 women who gave consent were invited for the questionnaire. Nine themes were identified: "knowledge of possible anti-D donorship," "experiences with Rhesus disease," "reasons to become a blood donor," "organ donorship," "knowledge of Rhesus disease," "experiences with blood donation," "boosting," "ways to recruit anti-D donors," and "practical considerations." All of these topics were covered in the questionnaire.

**TABLE 2. Negative factors of anti-D donorship**

Negative factor*	No. (%)	
	Anti-D donors, N = 174	Nondonors, N = 19†
Time	63 (36)	8 (42)
Travel time	37 (21)	4 (21)
Travel cost	7 (4)	4 (21)
Health	6 (3)	2 (13)
Confrontations with memories of HDFN	10 (6)	3 (16)
Negative experience of blood donation	7 (4)	6 (32)
Fear of needles	0 (0)	4 (21)
No negative factor	87 (50)	0 (0)
Other	16 (9)	3 (2)
Purpose of immunization	2 (1)	0 (0)
No fee	0 (0)	1 (6)
Problems with blood drawing	10 (6)	2 (13)
Opening hours	4 (2)	0 (0)

\* Multiple answers were possible.

† These were nondonors who were unwilling to become a donor.

### Quantitative results—responses

We invited all anti-D donors in the Sanquin donor database who met the inclusion criteria (340 of 501 women) and were reachable by email and all 410 reachable, RhD-immunized women between ages 43 and 65 years from the LUMC database to fill in the questionnaire. The overall response rate (excluding former donors) was 41.6% (312 of 750 women; 32.7% [134 of 410 women] in nondonors and 52.4% [178 of 340 women] in donors). In the group of responders, 57% were anti-D donors, and 43% were nondonors. In total, 41 former donors were not included in the analysis (10% of total response).

### Attitudes toward anti-D donorship

Almost all responders had ever heard about anti-D injections (98.3%; 347 of 353 women), and 94% (332 of 353 women) could explain more or less the purpose of anti-D injections. The majority of the 134 nondonors indicated that they would have become donors if they had known about the possibility (69.4%; 93 of 134 women) (Fig. 1). Of these, 43.3% pointed out that they wanted to receive more information first. To the item, "in the future, I will certainly sign up as anti-D donor" targeted to nondonors only, 47% (63 of 133 women) had a neutral response, and 35% (47 of 133 women) agreed or totally agreed. Table 1 shows the results regarding motivators for being or becoming an anti-D donor among donors and nondonors who intended to become donors ( $n = 35$ ). Anti-D donors gave the reason, "anti-D donors are needed" twice as often as nondonors ( $p < 0.001$ ). Nondonors responded slightly more often that they "want to do something in return"

**TABLE 3. Demographics, prosocial values, and severity of HDFN and their univariable contributions in predicting anti-D donorship**

Variable	No. (%)		p value*
	Anti-D donors, N = 178	Nondonors, N = 134	
Total no.	178 (57)	134 (43)	
Age: Mean $\pm$ SD, y	51.7 $\pm$ 9.6	50.4 $\pm$ 4.5	0.16
Family composition			0.001
Husband/wife and children	122 (68.5)	106 (79.1)	
Husband/wife	31 (17.4)	7 (5.2)	
Alone	14 (7.9)	4 (3.0)	
Single parent with children	11 (6.2)	17 (12.7)	
Religion			0.48
Roman Catholic	43 (24.2)	35 (26.1)	
Protestant	47 (26.4)	35 (26.1)	
Muslim	0 (0)	2 (1.5)	
None	81 (45.5)	55 (41.0)	
Christian other	7 (3.9)	6 (4.5)	
Education			0.65
None/lower education	27 (15.1)	15 (11.1)	
Secondary education	64 (35.9)	59 (44.0)	
Higher education	72 (40.4)	50 (37.3)	
University	14 (7.9)	9 (6.8)	
Employed	136 (76.4)	105 (78.4)	0.66
Registered organ donor	122 (68.5)	50 (37.3)	< 0.001
Volunteer work	88 (49.4)	51 (38.0)	0.05
Prosocial values median: P25-P75			
Trust scale†	7 (6-8)	7 (6-8)	0.84
Empathy scale‡	16 (14-16)	16 (14-17)	0.18
Altruism scale§	19 (17-20)	20 (18-21)	0.05
Severity of HDFN			< 0.001
No disease	53 (29.8)	10 (7.5)	
Fetal demise	14 (7.9)	24 (17.9)	
Prenatal transfusion	27 (15.2)	56 (41.8)	
Postnatal transfusion	64 (36)	27 (20.1)	
Phototherapy only	20 (11.2)	17 (12.7)	

\* P values were determined with the Pearson chi-square test, the Student t test, or the Mann-Whitney U test.

† Cronbach  $\alpha$  = 0.49.

‡ Cronbach  $\alpha$  = 0.65.

§ Cronbach  $\alpha$  = 0.73.

SD, standard deviation.

( $p = 0.09$ ) or “want to prevent others having a sick child or losing a child” ( $p = 0.14$ ). Those two reasons (31.2% and 33.9%, respectively) were also the most important values for nondonors who intended to become donors.

Frequently mentioned negative factors of anti-D donorship by anti-D donors were time investment (63 of 174 women) and travel time investment (37 of 174 women) (Table 2). One-half of respondents could not think of any negative factors. Respondents who certainly did not want to become anti-D donors ( $n = 19$ ) named as their reason “time investment” (42%) and “negative experiences with blood drawing in the past” (31%). “Being confronted with memories referring to HDFN” was not mentioned as a major negative factor in either group (6% of anti-D donors and 16% of nondonors).

### Recruitment of anti-D donors

Among the current anti-D donors, 44% became donors on their own initiative, and 51% became donors through a blood-bank flyer or a recruitment campaign. A small

group (14%) was made aware of the possibility of donating by a health care provider. Frequently mentioned preferred recruitment strategies were “personally by the obstetric care provider” (69%), “personally by the LUMC, the reference center for Rhesus disease” (67%), and “through social media” (49%). The right timing frequently mentioned was 6 weeks (31%) or 6 months after delivery (33%); 80% of responders mentioned that they would like to have received a personal letter from the LUMC to make them aware of the possibility of anti-D donorship.

### Univariable regression analysis

The general demographics, prosocial values, and obstetric medical histories and their contributions in the univariable analysis are described in Table 3. There were no significant differences between anti-D donors and nondonors in religion, educational level, or employment. Anti-D donors were slightly older than nondonors (not statistically significant). Overall, nondonors had experienced more severe HDFN in their obstetric history

**TABLE 4. Multivariable logistic regression: predicting the likelihood of anti-D donorship\***

Variable	OR (95% CI)		Multivariate p value
	Crude	Adjusted†	
<b>Demographics</b>			
Family composition			
Husband/wife and children	Ref	Ref	Ref
Husband/wife	6.28 (2.29-17.17)	7.88 (2.68-23.11)	0.03
Alone	4.60 (1.09-19.28)	5.79 (1.32-25.31)	0.02
Single parent with children	0.83 (0.32-2.12)	0.84 (0.32-2.17)	0.71
<b>Prosocial parameters and behavior</b>			
Altruism scale	1.12 (1.01-1.24)	1.12 (1.01-1.23)	0.04
Registered organ donor			
Yes	Ref	Ref	Ref
No	0.25 (0.14-0.47)	0.25 (0.14-0.46)	< 0.001
Choice to relatives	0.46 (0.21-1.02)	0.46 (0.21-1.01)	0.05
I don't know	1.13 (0.05-22.21)	0.91 (0.05-18.4)	0.95
<b>Severity of HDFN</b>			
No disease	Ref	Ref	Ref
Fetal demise	0.08 (0.03-0.22)	0.08 (0.03-0.27)	< 0.001
Prenatal transfusion	0.09 (0.04-0.22)	0.09 (0.04-0.22)	< 0.001
Postnatal transfusion	0.45 (0.18-1.10)	0.44 (0.18-1.08)	0.07
Phototherapy only	0.26 (0.24-0.67)	0.23 (0.08-0.64)	0.005

\*Goodness-of-fit tests showed no evidence of a lack of fit (Hosmer and Lemeshow  $p = 0.65$ ; explained variance, 24% [Nagelkerke  $R^2$  value]).  
†The multivariable analysis was adjusted for age.  
OR, odds ratio; CI, confidence interval; Ref, reference category.

( $p < 0.001$ ). Anti-D donors were more often registered organ donors and participated more frequently in volunteer work.

To assess the reliability of the altruism and empathy scales we used, Cronbach  $\alpha$  values were determined ( $\alpha = 0.73$  and  $\alpha = 0.65$ , respectively). Only the altruism scale showed good reliability and differed significantly between anti-D donors and nondonors. The trust scale consisted of only two items; therefore, the Cronbach  $\alpha$  was not determined.

### Predictors associated with anti-D donorship

All variables with a  $p$  value less than 0.20 in the univariable regression were included in the multivariable logistic regression (Table 4). Volunteer work and the empathy scale were not associated significantly with anti-D donorship in the multivariable analysis and subsequently were excluded from the final prediction model. The model was adjusted for age.

Family composition affected donorship; in particular, single women and partnered women without resident children were more likely to be anti-D donors. Not being registered as an organ donor and "leaving the choice for organ donation to relatives" also were associated negatively with anti-D donorship. Women who had experienced fetal or neonatal disease, especially those who had experienced severe disease such as fetal demise or prenatal transfusion, were less likely to be anti-D donors. A higher score on the altruism scale was positively associated with anti-D donorship.

## DISCUSSION

The objectives of this study were to gain a better understanding of the motivators and barriers for RhD-immunized women to become and remain anti-D donors and to identify the most promising way to approach this specific group of (potential) donors. The results showed that almost 70% of nondonors might have become donors if they had been informed of the possibility, whereas almost one-half first wanted to get more information before deciding on becoming an anti-D donor. This finding suggests that a lack of knowledge about the possibility of becoming an anti-D donor is a major barrier for becoming one. This was confirmed by the explanation frequently heard in the focus group interviews that the potential donors thought that they could not be whole blood donors because of the presence of red blood cell antibodies. The negative factors identified were time investment and travel time investment, but one-half of donors mentioned no negative factors of being an anti-D donor. "Being confronted with memories referring to HDFN" was not mentioned as a major disadvantage of anti-D donorship in either focus group. Motivators of nondonors to become anti-D donors were "want to do something in return" (31.2%) and "want to prevent others having a sick child or losing a child" (33.9%).

This study shows that (potential) anti-D donors differ from whole blood and plasma donors in sex (almost exclusively women); whereas, whole blood donors, the sex ratio is more balanced, and regular plasma donors are predominantly men.<sup>17</sup> Second, in this study, demographic



variables like educational level, age, and marital status also were associated with the intention to donate.<sup>18,26</sup>

To indicate prosocial behavior, we used “altruism,” “organ donorship,” and “volunteer work.” Similar to whole blood donors, those indicators reflected higher odds of being an anti-D donor.<sup>16</sup> Although the confrontation with memories of HDFN was not mentioned as a negative factor or barrier in focus group discussions, the experience of severe HDFN was associated with higher odds of not being an anti-D donor in the multivariate model. This may be explained in part by an overrepresentation of women with severe HDFN in the nondonor group. A possible further explanation might be that the severity of the disease restrains the obstetric care worker from discussing the possibility of anti-D donorship with the patient.

Tailored recruitment strategies should be designed for this particular group of potential donors. The obstetric care provider can play a major role in creating awareness of anti-D donorship in women with RhD antibodies. Although responders to our questionnaire mentioned that they would have liked to be contacted personally by the obstetric care provider 6 weeks to 6 months after giving birth, privacy and ethical considerations might be a barrier for the professional. Further research on this topic, in particular the view of obstetric care workers, will provide more insight. Possibly, a joint protocol might be created between the different parties involved to make it easier for obstetricians to retrieve consent of RhD-immunized women and to enable the blood bank to contact the woman after a certain time to provide her with information about anti-D donorship.

## STRENGTH AND LIMITATIONS

To the best of our knowledge, this is the first study on motivators and barriers for women with RhD antibodies to be or to become anti-D donors. The overall response rate in this study was 42%, which was comparable to that reported in other donor studies.<sup>17,27</sup> In both anti-D donors and nondonors, we achieved a sufficient response; the response in the anti-D donor group was higher. It is possible that the responses among nondonors are selective, because women who have a positive attitude to anti-D donorship will be more inclined to respond to both the questionnaire and the focus group discussions than nondonors with a more negative attitude. This might have resulted in overestimation of the proportion of women with a willingness to become anti-D donors. However, we think that our results provide a good overview of motivators and barriers to becoming an anti-D donor.

A major strength of our study is that we designed our questionnaire based on two focus group discussions in which we identified themes related to anti-D donorship. Moreover, we used validated scales (which also were used in the Donor InSight Study<sup>10</sup>) to measure prosocial values

and behavior. In doing so, we believe that our questionnaire covered all themes. A limitation of the questionnaire was that we asked donors and nondonors who would certainly not want to become anti-D donors (n = 19) only about negative factors of anti-D donorship. Therefore, information is still lacking about the negative factors among nondonors with the intention to become donors. Nondonors from the focus groups, like the anti-D donors, also indicated that too much time and travel investment might be negative factors for becoming an anti-D donor.

Because we identified nondonors through the LUMC, the reference center for the monitoring and treatment of alloimmunized pregnant women, we might have included a group of nondonors who experienced more severe HDFN than RhD-immunized Dutch women who were not referred to the LUMC. This may explain in part the contradiction in our results that the experience of severe HDFN was associated with not being an anti-D donor, whereas donors and nondonors did not consider being confronted with memories of HDFN as a major disadvantage of anti-D donorship.

## CONCLUSION

The main barrier for women who have RhD antibodies to be anti-D donors is the lack of knowledge about anti-D donorship. The profile of (potential) anti-D donors is different from those of whole blood and plasma donors, mainly because they are women and are eligible to become donors through immunization during pregnancy. Often mentioned, important motivators for being or becoming an anti-D donor are “want to do something in return” and “want to prevent others having a sick child or losing a child.” Predictive factors positively associated with anti-D donorship are family composition and altruism. Negatively associated predictive factors are “not being registered as an organ donor” and “severity of the experienced HDFN.” Blood bank and obstetric care providers should find ways to work together to better inform, recruit, and retain women to anti-D donorship.

## CONFLICT OF INTEREST

The authors have disclosed no conflicts of interest.

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## SUPPORTING INFORMATION

Additional Supporting Information may be found in the online version of this article.

**Appendix S1.** Topic list for focus group interviews.