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A cross-sectional study using a multidimensional approach among pregnant women

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BMJ Open ehealth literacy and health literacy among immigrants and their descendants compared with women of Danish origin: a cross-sectional study using a multidimensional approach among pregnant women

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ABSTRACT

Objective To explore ehealth literacy, ability to actively engage with healthcare providers and health system navigation among pregnant immigrant women and their descendants compared with women of Danish origin.

Design and setting A cross-sectional survey at antenatal clinics in 2016, Denmark.

Participants Pregnant women attending antenatal care (n=405).

Outcome measures The eHealth Literacy Questionnaire (eHLQ) and two domains from the Health Literacy Questionnaire (HLQ): ability to actively engage with healthcare providers and health system navigation. Range of response options for eHLQ (1–4) and HLQ (1–5). With mixed-effect linear regressions, eHLQ and HLQ among immigrants and their descendants compared with women of Danish origin were assessed.

Results The response rate was 75%. The overall trend was lower ehealth literacy and HLQ domains among immigrants and their descendants compared with women of Danish origin. For ehealth literacy, the results suggest that challenges related more to digital abilities than motivation, trust and access to technology. The mean ability to engage with digital services was 3.20 (SD 0.44) for women of Danish origin. Non-Western descendants (−0.14, 95% CI −0.31 to 0.02), non-Western (−0.20, 95% CI −0.34 to −0.06) and Western (−0.22, 95% CI −0.39 to −0.06) immigrants had lower adjusted means of this outcome. No differences in motivation to engage with digital services were found for descendants (−0.00, 95% CI −0.17 to 0.17), non-Western (0.03, 95% CI −0.11 to 0.18) or Western (−0.06, 95% CI −0.23 to 0.10) immigrants compared with the mean of the reference (2.85, SD 0.45). Lower ability to engage with healthcare providers was found for non-Western born immigrants (−0.15, CI 95% −0.30 to −0.01) compared with the mean of women with Danish origin (4.15, SD 0.47).

Conclusion Generally, descendant and immigrant women had lower levels of ehealth literacy and health literacy than women of Danish origin. These differences are potentially antecedents of adverse birth outcomes and could inform structural efforts to mitigate health inequalities.

Strengths and limitations of this study

- This is the first study to analyse ehealth literacy and health literacy among pregnant women using the eHealth Literacy Questionnaire and Health Literacy Questionnaire tools.
- The source population included many low-income and middle-income households, and the response rate was high, which makes the dataset relevant for analysing ethnic and social disparities.
- The sample size was limited but allowed for assessment of clinically relevant differences between the different maternal origins.

BACKGROUND

Across European countries, the proportion of births by immigrant women has rapidly increased and is currently around 10%–25% of the national numbers of births.¹ Immigrant women and their offspring experience higher rates of adverse birth outcomes, including stillbirth, compared with the native populations.^{2–4} The causes for the adverse outcomes are complex but have been linked to miscommunication and misunderstandings leading to suboptimal quality of maternity care, resulting in poorer outcomes.^{5–7} There is little knowledge of whether these disparities transfer over generations of women, but findings from Norway and the Netherlands have shown that descendants of immigrants had higher risks of stillbirth than the native populations.^{8,9}

With the current orientation towards patient-centred care, citizens are expected to have the ability to find and use health information, make decisions and navigate the healthcare system.¹⁰ Health literacy, which

relates to an individual's and community's ability to access, understand, appraise and apply information about health, is an important predictor for the engagement of immigrant groups in preventive healthcare services.^{11 12} A limited number of health literacy studies on immigrants have been undertaken in Europe. When comparing levels of health literacy among immigrants in Norway¹³ and Sweden¹⁴ with general European populations,¹⁵ it seems that adult immigrants have low health literacy levels.

Digitalisation of services and user involvement are present in current maternity care. For example, hospitals in Denmark have introduced digital self-reporting of physical and mental health before the antenatal care visits, and even highly educated women reported uncertainties in doing so.¹⁶ In Australia, a smartphone app was developed to address the needs of socially vulnerable pregnant women; however, the researchers concluded that social and mental health issues, financial constraints and digital skills were possible barriers for engagement with the app.¹⁷ Further, they advocate for more knowledge on how these women's everyday life challenges affect their engagement with healthcare providers and educational programmes, including apps. We are concerned that the move towards digitalisation and user involvement will create a digital divide and inequity, particularly across socioeconomic positions and ethnic groups.

A better understanding of digital competence in a health context is needed to address possible barriers and mitigate the development of health inequalities in pregnant women. The eHealth Literacy Questionnaire (eHLQ)¹⁸ provides an opportunity to understand users of digital services concerning their knowledge and skills, trust, motivation and experiences with digital services. By investigating pregnant women's ability to actively engage with healthcare providers and navigate the healthcare system and their ehealth literacy using multidimensional tools, we may gain novel insights into how the maternity care providers and the system can better adapt to the needs of ethnic minority women. This knowledge is much needed in the effort to reduce ethnic inequality in stillbirth.

Setting

Antenatal care at public facilities in Denmark is free to all women with legal residence.¹⁹ Around 60 000 babies are born in Denmark per year, and around 20% are born to immigrant mothers (7% of Western origin and 13% of non-Western origin).²⁰ Children born to Somali, Turkish and Pakistani women have been shown to have an increased risk of stillbirth and infant death compared with babies born to women of Danish origin.²¹ Furthermore, suboptimal care, due to cultural and language barriers, is also a concern in the Danish pregnancy and birth care.²² Overall, lack of cultural competence among healthcare providers has been identified as a patient safety issue for vulnerable immigrant patients in Denmark.^{23 24} While Denmark aims to be at the forefront of digitalisation, all communications from public authorities to citizens

above the age of 15 years are conducted online using the national digital mail system called e-Boks.²⁵ Exemption from e-Boks is permitted if an individual has language difficulties or disabilities.

Objective

This study aimed to explore disparities in ehealth literacy, active engagement with health professionals, and the ability to navigate the health system among immigrant women and their descendants compared with pregnant women of Danish origin.

METHODS

Study design and population

In this cross-sectional study, pregnant women were recruited from waiting rooms in the three antenatal care centres affiliated to the largest maternity ward in Denmark, in the Capital region, in February 2016. The recruitment was done during 11 full days, where HH and II invited all women who attended for antenatal care during these days to participate in the survey. Inclusion criteria were pregnancy and ability to reply to the questionnaire in Danish or English. The maternity ward had approximately 6800 births in 2016, and the recruitment was done at three of four antenatal clinics, where the proportion of ethnic minorities in the source population was highest. A total of 542 women showed up when II and HH were present, and of these women, 407 gave informed consent to participate. Thus, the response rate was 75%.

Two researchers (II and HH) who spoke Danish, English and Arabic administered the recruitment. The questionnaire was provided in either Danish or English. Assistance in filling in the survey was offered, if requested by the women. Oral and written informed consent was obtained.

The questionnaire included items on parity, age, civil status, educational level and main language spoken at home. Maternal education was categorised as short (0–10 years at school, short courses, vocational education and short higher education (2–3 years)), long (middle and higher education, 3+ years) and other (non-specified school and school achieved outside Denmark). Covariables were coded with the largest category as the reference, and due to respect of confidentiality, cell numbers are presented only if they include three or more observations.

Ethnicity

Ethnicity was defined by maternal country of origin and was categorised as Danish origin, immigrants and descendants. Immigrants were born outside Denmark. Descendants were born in Denmark and had two parents who were born outside Denmark, thus they were the second generation in Denmark. For descendants, the origin was determined by the country of birth of her mother (the grandmother-to-be). In the study, women were born in 53 different countries, and the most frequent countries were

Denmark (315), Turkey (10), Pakistan (5), Norway (5), Sweden (5), Romania (4), China (3), Germany (3), Iran (3), Iraq (3) and Somalia (3). Descendants were born in Denmark to mothers originating from 12 different countries with the following being the most frequent: Turkey (18), Pakistan (6) and Morocco (2). The origin of descendants and immigrants was then divided into Western and non-Western countries according to Statistics Denmark.²⁶ One woman had missing information on the country of birth, and data included only one Western descendant, who was removed from the analysis due to confidentiality; thus, n=405.

ehealth literacy and health literacy

Digital skills were measured by the women's report of being users of e-Boks or whether they had been exempted from usage. The users were asked to report on assistance from family and friends, if they have received a digital mail with a booking of the current antenatal care visit, and if they are signed up for receiving email prompts of new digital mail in their e-Boks on their usual email account. ehealth literacy was assessed by the eHLQ, which was developed in Danish and English concomitantly.¹⁸ The eHLQ consists of seven domains: eHLQ 1: using technology to process health information (five items), eHLQ 2: understanding of health concepts and language (five items), eHLQ 3: ability to actively engage with digital services (five items), eHLQ 4: feel safe and in control (five items), eHLQ 5: motivated to engage with digital services (five items), eHLQ 6: access to digital services that work (six items) and eHLQ 7: digital services that suit individual needs (four items). Each item was scored using 4-point ordinal scale response options (from strongly disagree (1) to strongly agree (4)). For each domain, the average score was calculated.¹⁸

We included two of the nine domains from the Health Literacy Questionnaire (HLQ),²⁷ which has previously been translated, culturally adapted and tested in Denmark²⁸ and internationally.²⁹ The included domains were HLQ 6: ability to actively engage with healthcare providers (five items) and HLQ 7: ability to navigate the healthcare system (six items). For both domains, response options were a five-point ordinal scale (from cannot do or always difficult (1) to always easy (5)). For each domain, the average was calculated.

Statistical analysis

We calculated the distribution of users of e-Boks by maternal ethnicity. One-way analysis of variance was used to assess ethnic differences in the mean levels in each eHLQ and HLQ domain. Histograms and box plots were studied for all eHLQ and HLQ domains by maternal ethnicity.

The associations between ethnicity and the eHLQ and HLQ domains were further studied by multilevel regression with women of Danish origin as the reference group and 0.05 significance levels. Adjustments for potential

a priori defined confounders were done in two models. Model 1 adjusted for maternal age, parity and marital status. In model 2, the association was further adjusted for educational level. To accommodate potential cluster effects due to different antenatal care centres, all regression models were analysed using a mixed model with the antenatal care centre as random effect using STATA V.15.

Patient and public involvement

The research was conducted as part of the MAMA ACT project, which is a collaborative project between researchers, midwives, and pregnant ethnic minority women aiming to promote equality in maternal and child health through better communication during pregnancy visit regarding complications.^{30 31} The project has a partnership with the Danish non-profit organisation, Neighbourhood Mothers, and several user board meetings have been conducted. Therefore, this study's target group of ethnic minority women has been included in the assessment of needs, research priorities and possible future implications. Further, II and HH are ethnic minority women of reproductive age and are part of the author group. The research will be disseminated to the public in general and a non-profit organisation working with ethnic minority women, as well as to maternity wards in Denmark.

RESULTS

Table 1 shows that non-Western immigrants and descendants were younger than Western immigrants and women of Danish origin. There were no differences between the ethnic groups in parity and marital status. The antenatal care centres differed between the groups: the non-Western-born women had the highest proportion of women with low education, and the majority of immigrants (Western and non-Western) did not speak Danish at home.

Figure 1 presents box plots of the eHLQ and HLQ data showing the middle 50% of the observations inside each box, with the whiskers extending 1.5 times the IQR below and above the smallest and largest 25% of the observations, respectively. Observations outside the range spanned by the whiskers are shown as points. From these data, it can be seen that for most eHLQ domains, respondents' median scores (the horizontal bars inside the boxes) centre around 'agree' (ie, score of 3), and the highest 25% of the respondents score up to 'strongly agree', while the lowest 25% of respondents score down to around 'disagree' across all groups. The exception was for eHLQ 7: digital services that suit individual needs, where there was a larger variation of the scores. For the HLQ domains, all respondents score from 2 (difficult) and up to 5 (always easy). There are more values outside the whiskers on these domains compared with the eHLQ plots.

Comparing the mean levels using multilevel regression, we found that there was an overall trend for all

**Table 1** Background characteristics (% (n)) of participants by maternal ethnicity (total sample size: 405)

	Danish origin (n=280)	Non-Western descendant (n=34)	Non-Western-born immigrant (n=55)	Western-born immigrant (n=36)
Maternal age (years)				
Less than 25	6.8 (19)	11.8 (4)	10.9 (6)	†
25–30	37.1 (104)	64.7 (22)	41.8 (23)	25.0 (9)
31 and over	55.7 (156)	23.5 (8)	47.3 (26)	69.4 (25)
Marital status				
With a partner	97.9 (273)	97.1 (33)	96.4 (53)	100 (36)
Parity				
Primi	48.0 (134)	47.1 (16)	30.5 (17)	55.6 (20)
Second	41.9 (117)	35.3 (12)	46.3 (25)	38.9 (14)
Third or more	10.0 (28)	17.7 (6)	22.2 (12)	†
Antenatal care centre				
Amager	75.0 (210)	20.6 (7)	41.8 (23)	72.2 (26)
Hvidovre	2.1 (6)	†	5.5 (3)	†
Ishøj	12.5 (35)	58.8 (20)	30.9 (17)	†
Taastrup	10.4 (29)	20.6 (7)	21.8 (12)	19.4 (7)
Maternal education*				
Short education	11.4 (32)	†	21.8 (12)	8.33 (3)
Long education	77.9 (218)	73.5 (25)	45.5 (22)	61.1 (22)
Other	10.7 (30)	20.6 (7)	32.7 (18)	30.6 (11)
Main language at home				
Danish	96.4 (268)	61.8 (21)	38.9 (21)	36.1 (13)
Non-Danish	3.6 (10)	38.2 (13)	61.1 (33)	63.9 (23)

*Categories defined as short education (0–10 years at school, short courses, vocational education, short higher education (2–3 years)), long (middle and higher education, 3+ years) and other (non-specified school and school achieved outside Denmark).

†Censored due to low numbers.

ethnic minority groups to score lower on the eHLQ/HLQ domains, reflected by the negative beta coefficients (table 2). This trend was not statistically significant for all groups and outcomes, but the pattern indicated that ethnic minorities overall faced more challenges.

For domains eHLQs 4–7, there were only small differences between the group of women with Danish origin and both immigrant groups; however, for eHLQs 1–3, differences were observed in model 2: for eHLQ 1: use of technology to process health information, Western-born immigrants reported lower levels compared to women of Danish origin reflected by the lower beta coefficient (0.19, CI –0.36 to –0.02. For eHLQ 2: understanding health concepts and language, non-Western immigrants reported lower levels (–0.14, CI –0.28 to –0.01). The eHLQ 3: ability to actively engage with digital services was lower for non-Western (–0.20, CI –0.34 to –0.06) and Western-born (–0.22, CI –0.39 to –0.06) women than the reference. For the HLQ 6: ability to actively engage with healthcare providers, the non-Western immigrants reported lower levels (–0.15, CI –0.30 to –0.01) compared with women of Danish origin in model 2.

Around 30% of the immigrant women but almost none of the women of Danish origin and descendant women were exempted from e-Boks (table 3). Among the users of e-Boks, more immigrants received assistance from friends and family than the reference group. Further, we studied the eHLQ domains among women who were exempt from e-Boks compared with the users of e-Boks as the reference (results not shown). As shown in table 3, the exempted group consisted of less than 35 women, including only three with Danish origin. The exempted group scored lower on eHLQs 1–4 in crude models; however, adjustment for their educational level explained the association for all but eHLQ 3: ability to actively engage with digital services. For eHLQs 5–7, there were no differences between the users and those who were exempted.

DISCUSSION

Principal findings

Although not all outcomes for all groups showed CIs that excluded 0, there was a pattern of small lower average levels of ehealth literacy and aspects of health literacy among ethnic minority women compared with women

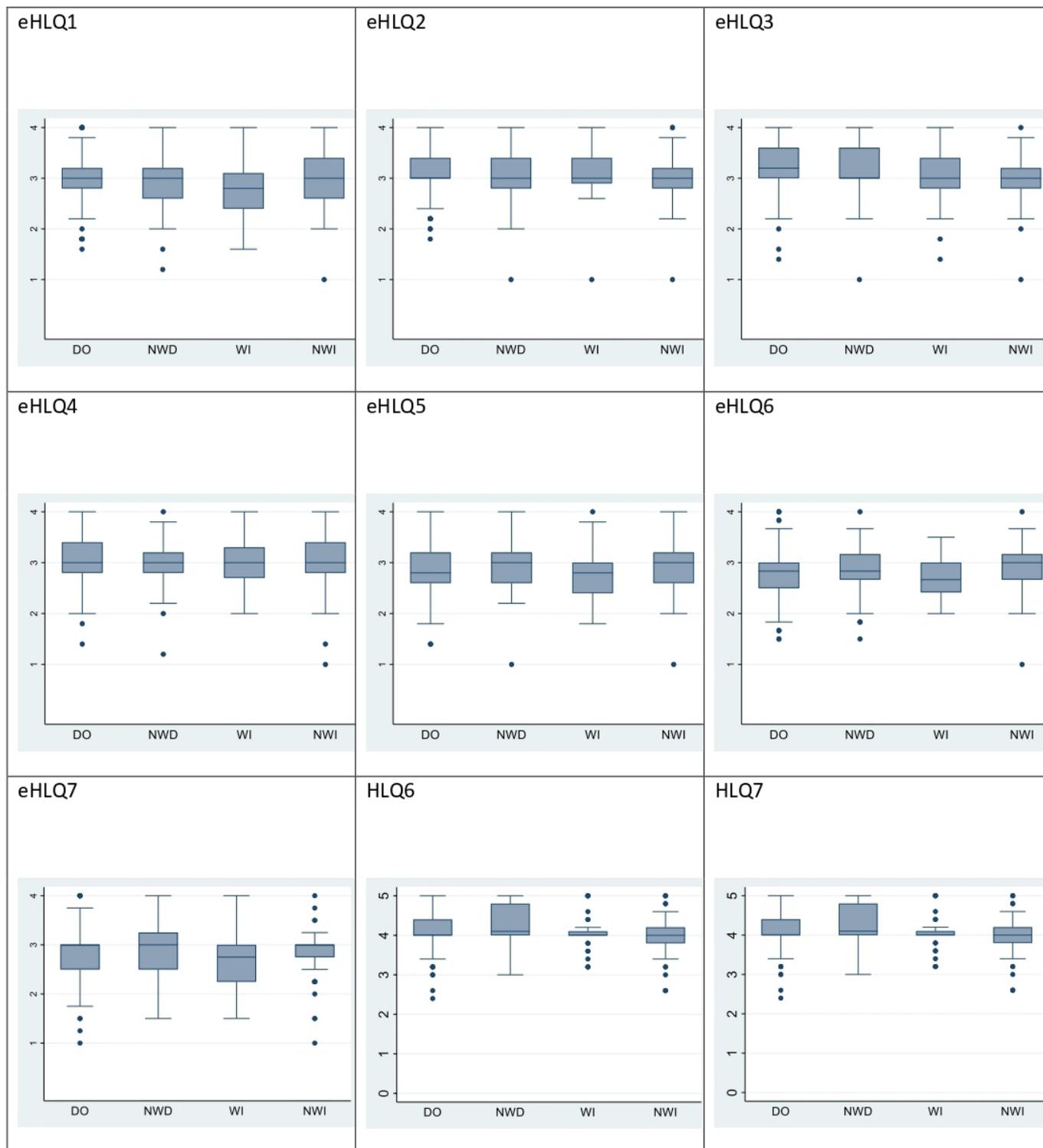


Figure 1 Box plots for eHLQ 1–7 and HLQ 6 and 7 by maternal ethnicity. DO, n=280; NWD, n=34; WI, n=36; NWI, n=55. eHLQ 1: using technology to process health information, eHLQ 2: understanding of health concepts and language, eHLQ 3: ability to actively engage with digital services, eHLQ 4: feel safe and in control, eHLQ 5: motivated to engage with digital services, eHLQ 6: access to digital services that work, and eHLQ 7: digital services that suit individual needs. HLQ 6: ability to actively engage with healthcare providers and HLQ 7: health system navigation. For eHLQ: 1=strongly disagree, 2=disagree, 3=agree, 4=strongly agree. For HLQ: 1=cannot do or always difficult, 2=usually difficult, 3=difficult, 4=usually easy, 5=always easy.

DO, Danish origin; NWD, non-Western descendant; NWI, non-Western-born immigrant; WI, Western-born immigrant.

**Table 2** eHLQ and HLQ domains by maternal ethnicity: means (SD) and crude and adjusted associations (total sample size: 405)

	Danish origin (reference) (n=280)	Non-Western descendant (n=34)	Non-Western-born immigrant (n=55)	Western-born immigrant (n=36)
eHLQ 1: using technology to process health information				
Mean (SD)	2.98 (0.45)	2.93 (0.60)	2.96 (0.57)	2.78 (0.49)
Coefficient crude (95% CI)		-0.05 (-0.22 to 0.12)	-0.02 (-0.16 to 0.12)	-0.20 (-0.36 to -0.03)
Coefficient adjusted* (95% CI)		-0.05 (-0.23 to 0.13)	-0.01 (-0.16 to 0.13)	-0.20 (-0.37 to -0.03)
Coefficient adjusted† (95% CI)		-0.05 (-0.22 to 0.13)	0.00 (-0.15 to 0.15)	-0.19 (-0.36 to -0.02)
eHLQ 2: understanding of health concepts and language				
Mean (SD)	3.15 (0.43)	3.02 (0.56)	2.98 (0.49)	3.07 (0.49)
Coefficient crude (95% CI)		-0.14 (-0.30 to -0.02)	-0.18 (-0.31 to -0.05)	-0.09 (-0.25 to 0.07)
Coefficient adjusted* (95% CI)		-0.12 (-0.29 to 0.04)	-0.18 (-0.31 to -0.04)	-0.08 (-0.24 to 0.07)
Coefficient adjusted† (95% CI)		-0.12 (-0.28 to 0.04)	-0.14 (-0.28 to -0.01)	-0.06 (-0.21 to 0.10)
eHLQ 3: ability to actively engage with digital services				
Mean (SD)	3.20 (0.44)	3.05 (0.61)	2.98 (0.52)	2.96 (0.52)
Coefficient crude (95% CI)		-0.15 (-0.32 to -0.02)	-0.22 (-0.36 to -0.09)	-0.25 (-0.41 to -0.09)
Coefficient adjusted* (95% CI)		-0.15 (-0.32 to -0.02)	-0.22 (-0.36 to -0.08)	-0.24 (-0.40 to -0.08)
Coefficient adjusted† (95% CI)		-0.14 (-0.31 to 0.02)	-0.20 (-0.34 to -0.06)	-0.22 (-0.39 to -0.06)
eHLQ 4: feel safe and in control				
Mean (SD)	3.11 (0.47)	2.99 (0.50)	2.99 (0.56)	3.01 (0.42)
Coefficient crude (95% CI)		-0.11 (-0.28 to 0.06)	-0.12 (-0.26 to 0.02)	-0.09 (-0.26 to 0.07)
Coefficient adjusted* (95% CI)		-0.12 (-0.29 to 0.05)	-0.12 (-0.26 to 0.02)	-0.08 (-0.25 to 0.08)
Coefficient adjusted† (95% CI)		-0.12 (-0.29 to 0.05)	-0.10 (-0.24 to 0.05)	-0.07 (-0.24 to 0.09)
eHLQ 5: motivated to engage with digital services				
Mean (SD)	2.85 (0.45)	2.85 (0.55)	2.88 (0.49)	2.79 (0.48)
Coefficient crude (95% CI)		-0.00 (-0.17 to 0.16)	0.03 (-0.11 to 0.16)	-0.06 (-0.22 to 0.10)
Coefficient adjusted* (95% CI)		-0.00 (-0.22 to 0.10)	0.03 (-0.11 to 0.17)	-0.06 (-0.22 to 0.10)
Coefficient adjusted† (95% CI)		-0.00 (-0.17 to 0.17)	0.03 (-0.11 to 0.18)	-0.06 (-0.23 to 0.10)
eHLQ 6: access to digital services that work				
Mean (SD)	2.81 (0.46)	2.79 (0.52)	2.82 (0.46)	2.68 (0.36)
Coefficient crude (95% CI)		-0.02 (-0.18 to 0.15)	-0.01 (-0.12 to 0.14)	-0.13 (-0.29 to 0.03)
Coefficient adjusted* (95% CI)		-0.05 (-0.21 to 0.12)	-0.01 (-0.14 to 0.12)	-0.11 (-0.26 to 0.05)

Continued

Table 2 Continued

	Danish origin (reference) (n=280)	Non-Western descendant (n=34)	Non-Western-born immigrant (n=55)	Western-born immigrant (n=36)
Coefficient adjusted† (95% CI)		-0.05 (-0.21 to 0.12)	-0.02 (-0.16 to 0.12)	-0.11 (-0.27 to 0.04)
eHLQ 7: digital services that suit individual needs				
Mean (SD)	2.82 (0.51)	2.90 (0.50)	2.85 (0.54)	2.67 (0.51)
Coefficient crude (95% CI)		0.08 (-0.10 to 0.26)	0.03 (-0.12 to 0.18)	-0.16 (-0.33 to 0.02)
Coefficient adjusted* (95% CI)		0.04 (-0.14 to 0.23)	0.01 (-0.14 to 0.16)	-0.14 (-0.32 to 0.03)
Coefficient adjusted† (95% CI)		0.06 (-0.13 to 0.24)	0.04 (-0.12 to 0.19)	-0.12 (-0.30 to 0.06)
HLQ 6: ability to actively engage with healthcare providers				
Mean (SD)	4.15 (0.47)	4.27 (0.52)	3.97 (0.53)	4.04 (0.46)
Coefficient crude (95% CI)		0.13 (-0.05 to 0.30)	-0.17 (-0.31 to -0.04)	-0.10 (-0.27 to 0.07)
Coefficient adjusted* (95% CI)		0.16 (-0.01 to 0.34)	-0.16 (-0.30 to -0.02)	-0.12 (-0.28 to 0.05)
Coefficient adjusted† (95% CI)		0.16 (-0.01;0.34)	-0.15 (-0.30; -0.01)	-0.12 (-0.28;0.05)
HLQ 7: health system navigation				
Mean (SD)	3.87 (0.51)	3.83 (0.76)	3.74 (0.53)	3.85 (0.48)
Coefficient crude (95% CI)		-0.04 (-0.23 to 0.15)	-0.12 (-0.28 to 0.03)	-0.02 (-0.20 to 0.16)
Coefficient adjusted* (95% CI)		-0.04 (-0.23 to 0.14)	-0.16 (-0.31 to -0.00)	-0.00 (-0.18 to 0.18)
Coefficient adjusted† (95% CI)		-0.05 (-0.24 to 0.14)	-0.15 (-0.31 to 0.01)	-0.00 (-0.19 to 0.18)

*Model 1: regression adjusted for maternal age, parity and marital status.

†Model 2: regression adjusted for maternal age, parity, marital status, and education.

eHLQ, eHealth Literacy Questionnaire; HLQ, Health Literacy Questionnaire.

of Danish origin, indicating that ethnic minorities face more challenges. For ehealth literacy, challenges were related to abilities and not motivation, trust and access to technology. Specific challenges were shown for the non-Western-born women, who reported lower levels of eHLQ 2: understanding health concepts and language and HLQ 6: ability to actively engage with healthcare providers than women of Danish origin did. Overall, our findings should be interpreted having in mind the small size of the ethnic minority groups. The ethnic differences in outcomes were not strongly affected by adjustment for maternal age, parity, marital status, and educational level, and there seemed to be challenges related to digital abilities and interaction with healthcare providers that could be important for the poorer health outcomes in the non-Western immigrant group. We further discuss our findings against the existing knowledge in the field to explore how these differences could act as barriers in maternity care.

Interpretation of findings relating to digital skills

In December 2016, 10% of the general Danish population above 15 years of age were exempted from e-Boks,²⁵ so our finding of approximately 30% of the immigrants being exempted is noteworthy. Our results show a clear pattern that immigrant women seemed to have lower levels of knowledge and skills to use digital services (eHLQs 1 and 3); however, these barriers are not related to access (eHLQs 6 and 7), motivation (eHLQ 5) or feelings of being safe and in control (eHLQ). Denmark has a very high digitalisation level compared with the European level³² and likely also the global level. Thus, the immigrant women in Denmark might not have been exposed and trained as much in digital competence throughout life. In the analysis comparing eHLQ among exempted women with the women using e-Boks (no matter ethnicity), we saw that educational level explained the association between e-Boks usage and eHLQs 1, 2 and 4 (data not shown). Therefore, it seems relevant to

**Table 3** Usage of and assistance with the digital mail system e-Boks* (% (n)) by maternal ethnicity (total sample size: 405)

	Danish origin (n=280)	Non-Western descendant (n=34)	Non-Western-born immigrant (n=55)	Western-born immigrant (n=36)
e-Boks exemption				
Yes	1.1 (3)	†	30.9 (17)	27.8 (10)
No	98.6 (276)	94.1 (32)	67.3 (37)	69.4 (25)
Don't know	†	†	†	†
Among users: with assistance				
Yes	1.8 (5)	†	10.8 (4)	20.0 (5)
No	97.8 (270)	96.9 (31)	89.2 (33)	80.0 (20)
Don't know	†	-	-	-
Among users: digital mail for booking of antenatal care				
Yes	45.7 (126)	71.9 (23)	56.8 (21)	52.0 (13)
No	50.4 (139)	28.1 (9)	37.8 (14)	40.0 (10)
Don't know	4.0 (11)	-	†	†
Among users: Digital mail prompts				
Yes	93.5 (258)	90.6 (29)	94.6 (35)	88.0 (22)
No	4.4 (12)	9.4 (3)	†	12.0 (3)
Don't know	2.2 (6)	-	†	-

*e-Boks is the Danish public authorities' digital mail system compulsory for all citizens above the age of 15 years.

†Censored due to low numbers.

initiate educational initiatives and practical training of digital abilities among exempted women and support systems are available for women, when current practice uses digital elements (booking of ultrasound and uptake of information in women's pregnancy records).

The domain eHLQ 2: understanding of health concepts and language was lower for the non-Western women than for the women of Danish origin, which represents a challenge for good communication in maternity care. A Dutch study has found that non-Western immigrant women with severe maternal morbidity had low levels of health information about pregnancy complications, which delayed their healthcare-seeking.³³ These women generally received suboptimal care. Thus, our findings of ethnic differences in this domain seem relevant for the mechanisms leading to ethnic disparity in suboptimal care. Maternity care providers need to consider women's individual knowledge levels in communication.

Interpretation of findings relating to engagement and health system navigation

Our findings are consistent with the lower health literacy levels found among adult immigrants in Norway and Sweden^{13 14}; however, these studies used a different tool for assessing overall health literacy, and we studied only two specific HLQ domains. Previous research has equally found an ethnic disparity in HLQ 6: actively engagement with healthcare providers.^{34 35} Bo *et al* found that ethnic minorities in Denmark (including both immigrants and second-generation descendants of immigrants) had lower active engagement than the native population.³⁴

In our study, only the group of non-Western women had a lower active engagement. The findings of Bo *et al* were population-based, and their response rate was 64%, while we included pregnant women only and had a response rate on 75%; thus, the findings are not directly comparable.

The ethnic disparity in stillbirth has been linked to communication barriers and suboptimal care.⁵ Our findings of lower engagement with healthcare providers among non-Western immigrant women could indeed be linked to lower quality of maternity care. In Denmark, the groups at increased risk of stillbirth are immigrant women originating from countries that are included in the non-Western group.²¹ To our knowledge, this is the first study to analyse the HLQ 6 dimension among non-Western immigrant, pregnant women in a high-income setting. It is important to further study whether this dimension is a pathway through which women from ethnic minority backgrounds receive suboptimal maternity care leading to higher rates of stillbirth.

Strengths and limitations

In this cross-sectional study, we had a relatively high participation rate, and data were collected from areas with a high proportion of low-income and middle-income households in the capital region of Denmark. This gives a good sample for a better understanding of the needs of potentially vulnerable pregnant women. In 2017, the response rate of the Danish national health survey was 58%, even though only Danish speaking adults were eligible for recruitment.³⁶ Thus, the response rate of 75%

and having a high proportion of participating women being immigrants or their descendants (more than 30%) are strengths of this study. However, the questionnaire was only administered in Danish and English, and the remaining 25% of the women are likely to be the most disadvantaged. Due to language and cultural barriers, the selection is likely to affect ethnic minorities more than ethnic Danes,³⁷ thus potentially underestimating ethnic differences. The study was limited to a single hospital and therefore may lack generalisability to other settings.

The validation of the HLQ was published in 2013 and has been used in several contexts. It has shown good validity across languages; however, the understanding of the specific items can differ from Western to non-Western cultures. The eHLQ was developed concomitantly in Danish and English in 2018. The questionnaire has shown high construct validity, discriminant validity and scale reliability.¹⁸

For both HLQ and eHLQ, the respondents are assessing their use of healthcare systems and digital solutions in general and not specifically related to their pregnancy. However, this assessment of general skills is very useful for comparison of groups, comparisons across contexts and for intervention evaluation.

Ethnicity as exposure can be considered as a marker of risk rather than a risk factor in itself.²¹ Migration factors from before, during and after the migration potentially all impact health. These factors relate to socioeconomic position, gender, culture, acculturation and discrimination. Thus, it is important to consider the links between socioeconomic position and ethnicity, and interestingly, adjustment for educational level did not have a strong effect on our results. The dataset is too small to go deeper into assessing potential mediation and interaction by educational level, but it should be further studied in future research.

CONCLUSION

Overall, there was a pattern towards small lower ehealth literacy and aspects of health literacy among ethnic minorities compared with women of Danish origin, indicating that ethnic minorities face more challenges. For ehealth literacy, challenges seem to relate to abilities and not motivation, trust and access to technology. Non-Western-born women seem to have specific needs for improved digital skills, increased understanding of health concepts and language, and better interaction with healthcare providers. It seems warranted that maternity care systems explore ways to adapt to these health literacy needs in efforts to reduce the risk of stillbirth among non-Western-born women.

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