Changes in Comprehensive Health Literacy Among First-Time Parents Attending Extended Home Visiting in Swedish Multicultural Settings: A Case-Comparison Study

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All methods were performed in accordance with the Declaration of Helsinki, research involving human participants. Ethical approval for this study was granted by the Stockholm Regional Ethical Review Board (registration no. 2017/1587-31/5). Written informed consent was given by the study participants for the interviews and the review of the children's medical records.

The datasets generated and analyzed during the current study are not publicly available because of the ethical approval (registration no. 2017/1587-31/5), which states that the use of interview data should respect the anonymity of participants only be accessed as a whole by the research group, and be stored locked by passwords. Data are available from the corresponding author upon a reasonable request.

Conflicts of interest: None to report.

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ABSTRACT

Introduction: This study aimed to gain knowledge about the impact of an extended postnatal home visiting program on parents' comprehensive health literacy (CHL) in multicultural, socioeconomically disadvantaged Swedish settings.

Method: This quasi-experimental study adopted a case-control sampling method recruiting first-time parents through two Child Health Care Centers in Stockholm. Participants were interviewed twice through structured questionnaires when their child was aged between less than two months (n = 193) and 15–18 months (n = 151) from October 2017 to August 2020. Analyses used linear regression models and nonparametric tests.

Results: A subgroup of parents that needed language interpreters demonstrated statistically significantly improved CHL from premeasures to postmeasures within the intervention group that received an extended home visiting intervention (F = 11.429; p <.001), and when compared with a corresponding subgroup that received merely the ordinary Swedish Child Health Care Centers program (F = 5.025; p = .027).

Discussion: Postnatal home visiting interventions may reduce inequity in CHL for parents living in multicultural, socioeconomically disadvantaged settings. J Pediatr Health Care. (2023) *37*, 391–401

KEY WORDS

Comprehensive health literacy, home visiting program, multicultural setting, nurse, parent

INTRODUCTION

Entering parenthood places demands on all parents as carriers of the ultimate responsibility for their children. Migrants, referring to people living in a country other than their countries of birth (International Organization for Migration, 2019), face even greater challenges when entering parenthood because of socioeconomic vulnerabilities and language-related barriers. Migration affects health and is regarded as a social determinant of health because of its potential to impact health outcomes (Migration Data Portal, 2021). The estimated number of migrants globally was 281 million in 2020 (McAuliffe & Triandafyllidou, 2021). "Multicultural settings," referring to neighborhoods with both foreign-born and native residents, are found in many countries. In these settings, vulnerable populations' adverse health may be related to lower health literacy (HL; Alemayehu et al., 2021).

Having multiple definitions, HL concerns the knowledge and competencies of individuals when meeting the complex health demands in our modern societies (Sørensen et al., 2012). Comprehensive health literacy (CHL) is "linked to general literacy and entails people's knowledge, motivation, and competences to access, understand, appraise, and apply health information [. . .]" (Sørensen et al., 2012). In this article, we explore parents' CHL in line with the HL definition by Sørensen et al. (2012) and focus on parents with infants (aged 0–18 months).

Many disadvantaged neighborhoods in Sweden are also multicultural, located in three Metropolitan areas, including Stockholm (Burström et al., 2014). These neighborhoods are characterized by lower educational levels, students' poorer educational achievement, adverse health and higher unemployment (Burström et al., 2014), all factors related to low HL. Earlier studies show that education is an important socioeconomic determinant of HL (Stormacq et al., 2019) and a recurrent indicator for different types of HL (Alemayehu et al., 2021; Pelikan et al., 2021; Stormacq et al., 2019). Higher education is associated with higher CHL, even among first-time mothers with newborn infants (Brandstetter et al., 2020). Accordingly, CHL or general HL, a related term, follows a social gradient (Pelikan et al., 2021). The latest European survey includes poor self-perceived health, financial deprivation, and a lower social position as indicators for low CHL (Pelikan et al., 2021). These indicators align with the reality of the target population of this study (Burström et al., 2014). In addition, migrants tend to have lower HL than general populations (Alemayehu et al., 2021).

Parents' low HL affects child health and leads to adverse health outcomes. Low HL affects parents' knowledge, attitudes and behaviors in disease prevention, acute care and chronic illness care (Morrison et al., 2019). Parents' low HL might contribute to the adverse child health seen even in multicultural settings of Stockholm (Burström et al., 2014), which improves parents' HL important. The research field of HL is expanding, but little is known regarding HL among migrant parents in multicultural settings, and few studies evaluate interventions that have the potential to improve parents' HL in these settings. However, a recent study among newly arrived migrant mothers in Australian settings reports a 4-week-long pilot HL intervention conducted by nurses and concludes mothers have higher HL scores postintervention than preintervention (Dougherty et al., 2021).

Health care providers have a key position in aligning health care demands with the HL skills of families with lower HL (Morrison et al., 2019). Recommended techniques to improve parents' HL include providing families with limited, plain language information; giving explicit instructions focusing on actions; using chunking, demonstrations and teach-back/show-back methods; offering written information as a supplement; and using pictographic/multimedia materials (Morrison et al., 2019).

Postnatal home visiting could be a method to improve parents' HL generally, as it is an evidence-based intervention used worldwide to improve families' various psychosocial living conditions and child health (Konrad et al., 2013; Sama-Miller et al., 2019). Postnatal home visiting programs target mostly risk families, including first-time parents, young parents, families living in deprived/disadvantaged areas, and families facing socioeconomic challenges or conditions such as mental illness or substance abuse (Konrad et al., 2013; Sama-Miller et al., 2019).

Home visiting programs have diverse designs of intensity, length, and number of visits or are combined with other parental interventions (Konrad et al., 2013; Sama-Miller et al., 2019). Home visitors are mostly professionals, such as nurses,

but sometimes laypeople or teams include different professionals (Konrad et al., 2013; Sama-Miller et al., 2019). These variations, together with different program contents and health care systems globally, resulting in a mixed picture of home visiting programs' outcomes. However, the evidence of home visiting programs includes significant short and long-term outcomes in the areas of child health; child development and school readiness; family economics; linkages and referrals; maternal health; positive parenting practices; reduced child maltreatment; and reduced family violence, crime, and juvenile criminality (Sama-Miller et al., 2019).

Little is known about how postnatal home visiting programs could address parents' CHL. In particular, parents' CHL as an outcome of postnatal home visiting programs in multicultural, disadvantaged settings seems unexplored. Similarly, how the number of home visits can impact parents' CHL has not been explored. Thus, this study aimed to gain knowledge about the impact of an extended postnatal home visiting program (Burström et al., 2017) on parents' CHL. The specific research questions were as follows:

1. How does first-time parents' CHL change in a multicultural, disadvantaged setting 15–18 months postnatally after the extended home visiting program compared with families participating in the ordinary Swedish Child Health Care (CHC) program?
2. How is the change in first-time parents' CHL related to the region of birth, time of residency in Sweden, the need for an interpreter and educational level in the intervention and comparison groups 15–18 months postnatally?
3. How is the number of visits within the extended home visiting program related to changes in parents' CHL within the family?

METHODS

Study Design

This study has a quasi-experimental case-control design with premeasures and postmeasures and was retrospectively registered (February 18, 2020) in the International Standard Randomised Controlled Trial Number registry (ISRCTN10336603).

Setting

The recruitment for this study started in October 2017 through two CHC centers in Northwest Stockholm (Rinkeby, intervention center; Tensta, comparison center). Rinkeby and Tensta have 16,900 and 18,600 inhabitants, respectively, and approximately 90% of them have migrant backgrounds, according to Swedish statistics (foreign-born persons and persons with two foreign-born parents; Stockholms stads, 2021). Socioeconomically, these city districts differ from the Stockholm County average and are more disadvantaged regarding educational level, student school performance, health, unemployment, income levels and political activity (Stockholms stads, 2021). The Tensta CHC center was merged with the neighboring Spånga CHC center by January 1, 2018, resulting in a higher number of Swedish-born parents in the comparison group. Furthermore, the recruitment from the comparison area ended prematurely on January 31, 2019, as the CHC center adopted the intervention. The recruitment through the intervention center was completed by April 2019. The follow-up interviews were conducted from March 2019 to August 2020.

Intervention

Both participating centers offered families the ordinary, universal Swedish CHC program, which is free of charge to all families with children aged 0–5 years. The ordinary program includes one postnatal home visit to families with newborn babies (The National Board of Health and Welfare, 2014). The Swedish CHC program is operated by CHC nurses (nurses specializing in child health), who follow child health and development, conduct child vaccinations, and collaborate with other health care professionals and child-related actors. The CHC program includes 14 scheduled visits for children aged 0–5 years; three of the visits included check-ups by general practitioners/pediatricians (The National Board of Health and Welfare, 2014).

The Rinkeby CHC center offered first-time families (mother's first child) an extended postnatal home visiting program/intervention during the child's first 15 months to supplement the ordinary Swedish CHC program. The program follows written guidelines (Mellblom et al., 2018) and aims to reduce child health inequalities (Burström et al., 2017). The program includes six joint home visits by a CHC nurse and parental advisor from social services when the child is a newborn aged 2, 4, 8, 12 and 15 months (Burström et al., 2017). Nurses' focus within the program is CHC issues, whereas parental advisors, who are also trained social workers, provide psychosocial support, especially regarding family relations and interactions (Barboza et al., 2021). Each home visit lasts around 1 hr (Mellblom et al., 2018). A further description of the intervention design is found elsewhere (Burström et al., 2017).

As this study focuses on CHL, the description of how the extended home visiting program can address parents' CHL is displayed in Table 1. The topics of health advice by CHC nurses are based on the home visiting program's guidelines (Mellblom et al., 2018). Table 1 displays possible CHL outcomes that refer to items/questions in European Health Literacy Survey Questionnaire short scale (HLS-EU-Q16) marked by items a-p (Mekhail et al., 2022; Wångdahl et al., 2014). HLS-EU-Q16 items (a-p) are found in the Box.

Participants

A case-control method was adopted at a geographic level to recruit first-time parents who registered their first child at the participating CHC centers during the recruitment period. The belonging to the intervention or the comparison group was based on children's registrations at the intervention or comparison center. CHC nurses identified the first-time

TABLE 1. Health advice topics that Child Health Care Centers (CHC) nurse discusses within the extended postnatal home visiting program leading to possible outcomes that contribute to parents' improved comprehensive health literacy (CHL)

Topics of health advisory by CHC nurse	Possible CHL outcome
Health advice about how to find information about health-related conditions	Improved knowledge/ability to find information about health conditions and treatments (a)
Health advice about how the Swedish health care system functions and how to navigate in it	Improved knowledge/ability to find professional help (b) and seek for "second opinion" (e) within health care
Plenteous child-related and general health advice by CHC nurse according to the needs of each family, including instructions to self-care	Improved knowledge/ability to understand what health care professionals (doctors) say during the health care visits (c) and how to understand and follow the instructions given by different health care professionals (d, g)
Conversation and advice about mental health conditions related to parenthood: stress and depression	Improved ability to find information on how to manage mental health problems (stress and depression; h)
Conversation and advice about lifestyle/health-related habits that affect the family (smoking and alcohol, etc.)	Improved understanding of warnings about unhealthy behaviors (e.g., smoking and drinking too much alcohol; l) and how to judge everyday behaviors in relation to health (p)
Conversation and advice about the health information in media and its reliability and referral of families to reliable media sources	Improved capability to judge if the information on health risks in the media is reliable (k) and how to protect oneself from illness on the basis of information in media (e.g., newspapers, leaflets, and internet; l) and understand information how to get healthier (o)
The conversation about family and social networks related to health advice	Improved understanding of different advice on health from family members or friends and how to judge them (n)

Note. *Data from Mellblom et al. (2018); Measured by HLS-EU-Q16. Letters a-p refer to items in HLS-EU-Q16 (see Box).*

families and mediated the contact to interviewers, who interviewed the parents after signing the informed consent. Participants' children needed to be aged < 2 months at the time of recruitment. One or both parents from each family had a choice to participate. As language interpreters were available, speaking fluent Swedish/English was not required.

The study aimed to recruit 120 participants in each group at baseline to secure statistical power even with attrition at follow-up. The required number of participants for statistical power at 0.80 for α 0.05 with a medium effect is 64 in each group with analysis of variance (Cohen, 1992).

Data Collection

Mainly face-to-face interviews at the CHC centers were conducted at baseline. The follow-up interviews were conducted mainly by phone when the children were aged 15–18 months. A structured questionnaire was used to collect parents' sociodemographic background factors and measure CHL. Each interview took 11–45 min to conduct. CHL was measured using the Swedish HLS-EU-Q16 (Wångdahl et al., 2014). HLS-EU-Q, with its different versions (HLS-EU-Q47 and HLS-EU-Q16), was developed to measure CHL in European populations (Sørensen et al., 2013). The questions of HLS-EU-Q16 are displayed in the Box. The Swedish version of HLS-EU-Q16 and its translations to several languages (Arabic, Dari, Farsi, Somali, Sorani) have been used to measure CHL among newly arrived migrants in Sweden previously (Wångdahl et al., 2014). HLS-EU-Q16 (Swedish version) is validated in the target population and found to measure CHL as one factor (Mekhail et al., 2022).

BOX. European Health Literacy Survey Questionnaire short scale in English

Items

How easy/difficult is it for you to find information on treatments for illnesses that concern you?
How easy/difficult is it for you to find out where to get professional help when you are ill (e.g., doctor, pharmacist or psychologist)?
How easy/difficult is it for you to understand what your doctor says to you?
How easy/difficult is it for you to understand your doctor's or pharmacist's instructions on how to take a prescribed medicine?
How easy/difficult is it for you to judge when you need to get a second opinion from another doctor?
How easy/difficult is it for you to use the information the doctor gives you to make decisions about your illness?
How easy/difficult is it for you to follow instructions from your doctor or pharmacist?
How easy/difficult is it for you to find information on how to manage mental health problems such as stress and depression?
How easy/difficult is it for you to understand warnings about behavior (e.g., smoking, low physical activity and drinking too much)?
How easy/difficult is it for you to understand why you need health screenings (such as breast examinations, blood sugar or blood pressure tests)?
How easy/difficult is it for you to judge if the information on health risks in the media is reliable (e.g., from TV or the internet)?

Note. *Each item can be answered according to the following (1–4 points): very difficult, 1; fairly difficult, 2; fairly easy, 3; very easy, 4.*

During the data collection of this study, the available translations of HLS-EU-Q16 were used as support for interpreters during the interviews. In a few cases, HLS-EU-Q16 was translated spontaneously by interpreters. Interviews used paper-based questionnaires, and a code was assigned to each participant to ensure anonymity. After data entry per code in the computer files, these were locked by passwords, and the questionnaires were stored in a locked archive accessed by the involved research group at Karolinska Institute.

After follow-up interviews (October-November 2020), the number of home visits was reviewed in children's medical records. Participants had consented to the review at baseline. The data from children's medical records were entered into the existing data file and linked with the participating parents.

Variables and Outcome Measures

The background variables of the participants collected at baseline included parental age, country of birth, time of residency in Sweden (years), length of education (years) and marital status. The need for an interpreter (yes/no) was noted at baseline and follow-up.

Participants' countries of birth were categorized into five geographic regions: Sweden, Europe, Sub-Saharan Africa, the Middle East and North Africa region, and Asia.

For the total CHL scores for each participant at baseline and follow-up, the responses to the 16 HLS-EU-Q16 multiple-choice questions were coded and summed up on a scale of 1−4 points (very difficult, 1; fairly difficult, 2; fairly easy, 3; very easy, 4), giving total scores of 16−64 (Pelikan et al., 2014). HLS-EU-Q16 items are displayed in the Box. The "Don't know" response was omitted as a response alternative in the HLS-EU-Q16 questionnaire. The dichotomization of the scores according to guidelines was not adopted (Pelikan et al., 2014), as the study explored changes in participants' total CHL scores from prepost measurements. A new variable, "CHL change," was created by subtracting the total CHL score at baseline from the total CHL score at follow-up. This variable was the main outcome in analyses exploring the change in parents' CHL.

Family averages for CHL and other continuous variables were counted and used in the analysis exploring the number of home visits per family. Regarding geographic regions of birth, the mother's region of birth was followed, and if any participant needed an interpreter, the family was regarded to need an interpreter. The number of home visits in the intervention group was categorized as six visits or less than six visits.

Ethical Approval and Consent to Participate

All methods were performed following the Declaration of Helsinki, research involving human participants. Ethical approval for this study was granted by the Stockholm Regional Ethical Review Board (registration no. 2017/1587-31/5). Witten informed consent was given by the participants of the study.

Statistical Methods

SPSS software (version 27, IBM) was used for data analyses. Descriptive statistics described the sociodemographic background factors of the participants. Because of the nonparametric distribution of continuous background factors, a Mann-Whitney U test was used to explore differences between the groups. A χ^2 test was used to explore differences in categorical factors. The same tests were applied to explore differences in background factors between the families participating in six and less than six visits home visits within the program.

The chosen significance level for all analyses was 0.05. Bonferroni's confidence interval adjustment was used for the general linear regression model (GLM) analyses.

Total scores of CHL at baseline and follow-up were observed through descriptive statistics in each group. A score of zero was given for missing values in HLS-EU-Q16. Participants who had two or fewer missing values were replaced with series means. Differences between the groups were evaluated through the Kruskal-Wallis test because of the nonparametric distribution of total score HL. Median and range (minimum to maximum [min-max]) values are reported to demonstrate the distribution.

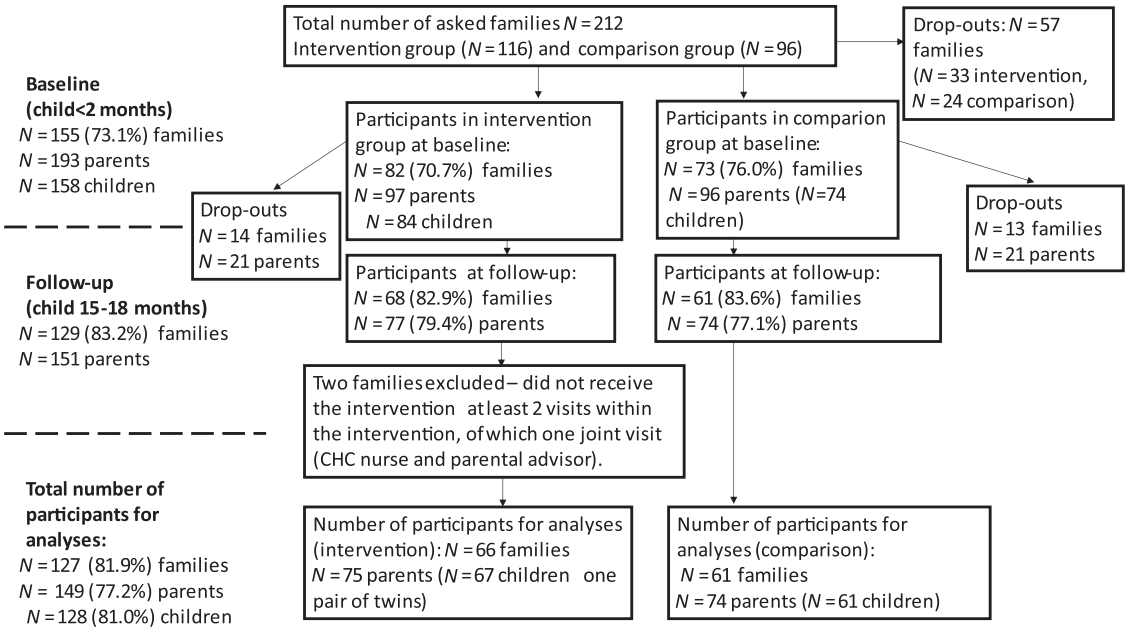
GLM analysis was used to compare CHL change between the intervention and comparison groups as it enables control for the background variables differing between the groups. CHL change was assigned to be the main outcome and the group belonging to the main effect/predictor in the model. Background variables differing between the groups were covariables and controlled for in the model.

Multicollinearity analyses were conducted for all GLM analyses to evaluate if any correlation between the included variables was greater than 0.8. The other assumptions for GLM (normality, equality of variance and linearity) were inspected in the models or their standardized residuals. The result from the analyses with GLM, after the removal of identified outliers, are reported in the results section.

CHL change within and between the subgroups, 15−18 months postnatally, were explored. The following variables were categorized for the subgroup analyses: region of birth (Swedish-born [yes/no]), time of residency in Sweden ($\leq$ 3 years, $>$ 3 years, $<$ 25 years, $\geq$ 25 years) on the basis of the quartiles within the sample, need of interpreter (yes/no) and length of education ($<$ 9 years, 9−12 years, $>$ 12 years). Education categories were based on whether participants' education was shorter than elementary school ($<$ 9 years), completed elementary school/high school (9−12 years) or postsecondary studies ($>$ 12 years).

GLM was used for the subgroup comparisons after assumptions for GLM and after removing outliers. CHL change was the dependent variable, and group belonging (intervention/comparison) was the main predictor in the model. Additional predictors (categorical variables) were added one at a time. For the significant differences, a post hoc test using pairwise comparisons showed the location of difference within and/or between the groups.

FIGURE. Participants at baseline and follow-up were divided into intervention and comparison groups.



If assumptions for GLM were not met, a nonparametric Kruskal-Wallis test was used to evaluate the CHL change between groups. For the Kruskal-Wallis test, new categorical variables were computed using a combination of group belonging and the categorized variable to be evaluated.

Descriptive statistics (mean, *SD*, and min-max) were reported for analyses using GLM, median and min-max for the Kruskal-Wallis test. Minimum and maximum values for CHL change were reported to demonstrate the wide distribution of CHL change in the sample and subgroups, as CHL change took both a negative and positive value.

Student *t* test was used to evaluate CHL change between families that received six and less than six home visits as CHL change for families followed a normal distribution. Family averages for CHL change were used when both parents in a family participated; otherwise, the participating parent's CHL change represented the family.

Missing Values Analyses

The recommendation to remove participants with > 2 missing values in HLS-EU-Q16 (Pelikan et al., 2014) was followed both for baseline and follow-up measurements. After that, the remaining participants' incomplete responses (missing values) were given a zero. In addition, missing values of HLS-EU-Q16 were replaced by individual series means to observe if variables for total CHL at baseline and follow-up differed from the values when missing values were given a zero.

RESULTS

At baseline, face-to-face interviews (n = 190) and a few phone interviews (n = 3) were conducted. The total number of participating parents/families at baseline and follow-up are displayed in the Figure. The overall participation rate for families was 73.1% at baseline and 83.2% at follow-up.

For the follow-up interviews, the participants preferred phone interviews (n = 120; 79.5%), first because they had a busy schedule and later because of the COVID-19 outbreak during Spring 2020. Most participants who needed an interpreter were interviewed at CHC centers (n = 20; 13.2%), and few other participants. The number of participants who needed interpreters at baseline and follow-up is displayed in Table 2. The most common reasons for dropouts at follow-up were that participants could not be reached and lacked interest or time.

The review of children's medical records led to the removal of two families from the intervention group as they did not meet the criteria of the intervention (minimum two visits within the intervention, of which at least one joined visit by CHC nurse and parental advisor from social services) and were excluded from the data analyses (Figure). Thus, the total number of interviewed parents in the dataset before the onset of analyses for this article was 149 parents representing 127 families (Figure).

Five participants having more than two missing values in HLS-EU-Q16 were removed from the dataset at follow-up. Thus, the total number of participants for the analysis comparing "CHL change" between the groups was 144 parents (intervention group, n = 71; comparison group, n = 73).

Analyses testing if the number of home visits within the program impacted families' CHL was based on 66 families in the intervention group (received six visits; n = 30, received less than six visits; n = 36).

Parents' sociodemographic background factors are displayed in Table 2. The two groups differed significantly

TABLE 2. Sociodemographic characteristics of the participants at baseline and follow-up (*n* = 149)

Background variables	Groups: Intervention	Groups: Comparison	Group differences[a]
Participating families, *n*	66	61	
Children, *n*	67	61	
Males	47.8 (32)	45.9 (28)	
Females	52.2 (35)	54.1 (33)	
Parents, *n*	75	74	
Females	81.3 (61)	71.6 (53)	
Males	18.7 (14)	28.4 (21)	
Parental age, years[b]			
Total	29.9 ± 8.4 ± (17–64)	30.5 ± 5.2 (20–49)	
Females	27.8 ± 5.9 (17–40)	29.2 ± 4.5 (20–42)	
Males	38.9 ± 11.4 (24–64)	33.7 ± 5.4 (26–49)	
Parents' region of birth			$\chi^2 = 29.609$; $p < .001$*
Sweden	–	41.9 (31)	
Europe	9.3 (7)	–	
MENA countries[c]	28.0 (21)	13.5 (10)	
Sub-Saharan Africa	41.3 (31)	28.4 (21)	
Asia	16.0 (12)	13.5 (10)	
Need of interpreter			
All parents (baseline)	29.3 (22)	12.2 (9)	$\chi^2 = 6.666$; $p = .010$*
All parents (follow-up)	24.0 (18)	8.1 (6)	$\chi^2 = 6.962$; $p = .008$*
Years in Sweden			$U = 1{,}669.000$; $p < .001$*
Total	8.4 ± 8.2 (0.3-34.0)	17.2 ± 12.7 (0.3-39.0)	
Females	7.3 ± 7.6 (0.3-27.0)	16.8 ± 12.7 (0.3-39.0)	
Males	13.4 ± 9.5 (2.0–34.0)	18.1 ± 12.9 (3.0–37.0)	
Education level, years			$U = 203.500$; $p = .005$*
Total	12.1 ± 4.2 (2–22)	13.9 ± 3.9 (0.0–21.5)	
Females	12.1 ± 4.1 (2–22)	14.1 ± 4.0 (0.0–20.0)	
Males	11.9 ± 4.7 (2–20)	13.7 ± 3.7 (7.0–21.5)	
Marital status (baseline)			
Married: cohabiting	86.7 (65)	87.8 (65)	
Married: living apart	–	8.1 (6)	
BF/GF: living apart-single	10.7 (8)	–	

Note. *BF, boyfriend; GF, girlfriend; MENA, Middle East and North Africa; Values are presented as mean ± SD (range) or n (%). –n < 5 is not displayed.*
[a]*Group differences were evaluated by Mann-Whitney's U test and χ2 test.*
[b]*At baseline interviews when the child was aged < 2 months.*
[c]*MENA countries: Algeria, Bahrain, Egypt, The United Arab Emirates, Iran, Israel, Jordan, Kuwait, Lebanon, Libya, Morocco, Oman, Qatar, Saudi Arabia, Syria, Tunisia, Palestine, Yemen, and Turkey.*
**Significance level < .05.*

regarding the region of birth, need for interpreters, parents' time of residency in Sweden and length of education.

Main Results

Parents' total CHL scores did not differ significantly between the groups at the baseline or follow-up when missing values of HLS-EU-Q16 were given a zero or replaced by individual

TABLE 3. Total score for comprehensive health literacy (CHL) at baseline and follow-up in intervention and comparison groups (*n* = 144)

Variables	Groups: Intervention (n = 71)	Groups: Comparison (n = 73)	Group difference*
CHL baseline (MV = 0)	47 (35–64)	47 (29–64)	$k = 0.953$; $p = .329$
CHL baseline MV replaced median (range)	47 (35–64)	48 (29–64)	$k = 1.916$; $p = .166$
CHL follow-up (MV = 0) median (range)	48 (38–64)	50 (38–64)	$k = 2.030$; $p = .154$
CHL follow-up MV replaced median (range)	48 (38–64)	50 (39–64)	$k = 1.520$; $p = .218$

Note. *MV, missing value. MV = 0, missing values in HLS-EU-Q16 were given zero. MV replaced, missing values (incomplete responses) in HLS-EU-Q16 were replaced with series means. Participants with less than two missing values were included.*
**Significance level < .05 as determined by the Kruskal-Wallis test.*

TABLE 4. Comprehensive health literacy change in subgroups within the intervention and comparison groups

	Groups		Results	
Variables	**Intervention**	**Comparison**	**Main**	**Interaction**
Swedish-born (*n* = 142)			*F* = 0.028; *p* = .867	*F* = 0.020; *p* = .889
Yes	1.75 ± 5.85 (−5 to 8)	2.23 ± 5.04 (−8 to 13)		
No	2.60 ± 6.02 (−18 to 16)	2.64 ± 4.67 (−6 to 13)		
Time in Sweden, years (*n* = 141)			*F* = 5.640; *p* = .343	
≤ 3	5.0 (−5 to 15)	0.0 (−3 to 13)		
3–25	1.0 (−8 to 11)	2.0 (−8 to 12)		
≥ 25	3.0 (−3 to 5)	3.0 (−8 to 13)		
Need of interpreter, % (*n* = 141)			*F* = 1.660; *p* = .200	*F* = 7.62; *p* = .007*
Yes	5.60 ± 6.41 (−5 to 15)	1.00 ± 4.94 (−3 to 13)		
No	1.00 ± 4.96 (−8 to 11)	2.67 ± 4.79 (−8 to 13)		
Education, years			*F* = 1.058; *p* = .305	*F* = 1.242; *p* = .292
< 9	2.09 ± 5.45 (−6 to 12)	7.33 ± 6.66 (0–13)		
9–12	2.30 ± 6.43 (−8 to 16)	1.73 ± 4.42 (−6 to 12)		
> 12	3.00 ± 5.16 (−6 to 15)	2.50 ± 4.79 (−8 to 13)		

Note. *Values are presented as mean ± SD (range) or median (range). −n < 5 is not displayed.*
**Significance level is < .05 as determined by the general linear mean and Kruskal-Wallis tests.*

series means (Table 3). As CHL did differ just slightly depending on if missing values were given a zero or replaced by series means (Table 3), further analyses were conducted by CHL change in which missing values were given a zero.

Results of the GLM indicated no significant findings regarding CHL change between the intervention group that received the extended postnatal home visiting program within the Swedish CHC program and the comparison group that received only the ordinary Swedish CHC program ($F = 0.087$; $p = .768$) and when controlled for background differences and after the removal of two outliers ($n = 142$).

A statistically significant difference was observed regarding the interaction effect, "group belonging x need of interpreter" in GLM, in which CHL change was the main outcome, and group belonging to the main predictor and need of interpreter the additional predictor (Table 4).

Pairwise comparisons (post hoc) showed that the participants who needed interpreters in the intervention group at baseline had a significantly greater CHL change when compared with those who did not need interpreters within the same group (F=11.429, $p < .001$). Furthermore, the participants in the intervention group who needed interpreters at baseline had significantly greater CHL change than the corresponding subgroup in the comparison group (F=5.025, $p = .027$).

The background variables between the groups that received six or less than six home visits to the program did not differ significantly. Parents CHL change in the group that received all six visits within the intervention group (2.39 ± 7.64; $-n < 5$ is not displayed) compared with the group that received less than six visits (2.81 ± 5.96) did not differ significantly from each other, Student *t* test (degrees of freedom = 64) = 0.249; $p = .804$.

DISCUSSION

This study aimed to gain knowledge about the impact of an extended postnatal home visiting program on parents' CHL in multicultural, socioeconomically disadvantaged settings in Sweden. Parents' improved CHL as an outcome of home visiting programs has not been previously explored, even if parents' low HL has several negative effects on child health (Morrison et al., 2019) and postnatal home visiting programs have several positive impacts on families' psychosocial living conditions and child health (Sama-Miller et al., 2019).

In our study, parents' CHL scores increased in both groups from baseline to follow-up in an equivalent way, and no significant differences were found between the groups. However, the subgroup of parents in the intervention group who needed language interpreters demonstrated significantly improved CHL from baseline to follow-up measurements within the intervention group and in comparison with the corresponding subgroup in the comparison group. The number of home visits received did not impact families' CHL.

The nonsignificant finding of CHL between the intervention and comparison groups can partly be explained by the low number of home visits ($n = 6$) within the intervention of this study (Burström et al., 2017). Several home visiting programs in the United States offer families more intensive visiting over a longer period from the time of pregnancy until the child turns 2–3 years (U.S. Department of Health and Human Services, 2022). In addition, in this study, even the comparison group participated in the Swedish CHC program (The National Board of Health and Welfare, 2014), which might impact parents' CHL. The health advice topics discussed during the home visiting intervention (Mellblom et al., 2018) may also be discussed within the ordinary CHC program (The National Board of Health and Welfare, 2014).

However, the home visiting intervention offers more occasions and time for the families to address health-related issues in their home environment with two different professions (Barboza et al., 2022).

The significant increase in parents' CHL in this study after the home visiting intervention among those who needed interpreters is in line with results from a previous pilot study among newly arrived mothers with a need of interpreters in Australia who demonstrated improved HL after an intervention (Dougherty et al., 2021). However, the methods of the interventions, the HL tool and the sociodemographic composition of the target group are different in the Australian study (Dougherty et al., 2021). Nevertheless, results from previous Swedish studies have identified low CHL as a reality both among newly arrived migrants (Wångdahl et al., 2014) and a subgroup of Arabic-speaking migrants (Bergman et al., 2021). Actions or interventions to address migrants' lower CHL have been requested on the basis of the research findings (Wångdahl et al., 2014).

Our results indicate that the home visiting intervention may address CHL-related issues in a way benefiting parents who need an interpreter. This subgroup can also be regarded as more vulnerable because of language and cultural barriers. The contents of the home visiting intervention (Mellblom et al., 2018) include several CHL topics promoting accessing, finding, appraising, and using health information (Sørensen et al., 2012) and use several recommended techniques that are identified to improve parents' HL including pictorial material, demonstrations, plain language information accompanied with written information (Morrison et al., 2019). For instance, home visitors guide parents on how the Swedish health care system functions, how to appraise children's health conditions and find reliable health information (Mellblom et al., 2018). In addition, the home visiting program focuses on parents' questions, offers additional occasions of visits with longer duration in the home environment and combines two professions (Mellblom et al., 2018) which may be the components benefiting and supporting parents who need interpreters and thus impacting even their CHL positively. In addition, home visitors of this study are experienced in communicating with the target group because of their daily work in the study settings, which is an important factor when reaching out to vulnerable populations (Nguyen Thanh, Cheah, & Chambers, 2019). Indeed, providing information, effective communication, and structured education are important factors to improve HL (Nutbeam et al., 2018) and seem all to be components practiced within the home visiting intervention of this study.

One further speculation for our results of parents' increased CHL, regardless of the group, is parents' increased feeling of responsibility when entering parenthood, regardless of CHC programs or parental interventions. Another underlying cause impacting CHL, not explored in this study, maybe access to social networks. Results from the same population show that first-time parents who lack social networks have lower CHL (Mekhail et al., 2022). Earlier research also describes that access to social networks may compensate for low CHL levels (Ishikawa & Kiuchi, 2019).

Although the HLS-EU-Q16 in this study captured the trend that parents' CHL increased and that CHL increased significantly at the follow-up measurements in one subgroup, it needs to be questioned how well HLS-EU-Q16 addressed the impacts gained by the home visiting intervention. As HLS-EU-Q16 does not focus specifically on child-related health issues, alternative tools evaluating parents' HL in relation to the home visiting program's contents need to be considered to capture the effects that home visiting can have on parents' HL.

The number of home visits (six or less than six) did not significantly impact parents' CHL in this study. The number of home visits is low in our study, and not all families received all six joint visits. The number of visits differs from other home visiting programs, with a higher number of visits and different intensities of the programs (Konrad et al., 2013; Sama-Miller et al., 2019). However, health care systems in different countries around the world do not necessarily offer free, universal CHC programs with multiple appointments to all families as in Sweden (The National Board of Health and Welfare, 2014), which makes it difficult to compare the Swedish settings and programs for example in the United States.

Limitations and Further Studies

Several statistically significant differences were found in parents' socioeconomic background factors between the groups. The merging of two CHC centers in the comparison area during our recruitment period resulted in a larger group of Swedish-born parents in the comparison group. A larger sample would enable more detailed analyses of the relationship between parental CHL and other variables.

A randomized controlled trial would have been a better alternative to evaluate the home visiting program's effects on parents' CHL. Nevertheless, as families at the intervention site are already living in socioeconomically disadvantaged conditions, it has been important since the program started in 2013 to avoid stigmatizing, and all first-time parents in the same neighborhood are offered the intervention (Burström et al., 2017). Our choice of tool to measure CHL may not have been optimal as the evaluated program focuses primarily on child health and development (Burström et al., 2017), whereas the HLS-EU-Q instruments focus on measuring CHL in general populations (Sørensen et al., 2013). However, the topics within the home visiting program covered most of the areas addressed in the HLS-EU-Q16 tool. This study did not measure if parents had adequate CHL in the prepost measures, which can be a limitation in the HL research field. However, the study aimed to observe the possible change in parents' CHL resulting from the intervention, an unexplored research area.

This study may have had a social-desirability bias (Krumpal, 2013). Participants may have overestimated their responses to the questions to please the interviewers, especially in the face-to-face interviews. Parents scored high on

CHL in the baseline measurements (Mekhail et al., 2022), and this study showed parents' improved CHL in follow-up measurements. Similar tendencies to score high are reported in the intervention site when exploring parental self-efficacy in face-to-face interviews (Marttila et al., 2015).

The heterogeneity of the study population challenged our study. Exclusion of participants without sufficient proficiency in Swedish/English would have been easier, as the use of interpreters may have impacted parents' comprehension of the CHL questions. Furthermore, the translated HLS-EU-Q16 questionnaire was not available in all languages to support interpreters during the interviews, which is a limitation of the study, as interpreting HLS-EU-Q16 simultaneously is challenging. However, this only occurred on a few occasions in our data collection. Using interpreters has enabled the implementation of this study, which is explorative in parents' CHL in multicultural settings connected to postnatal home visiting. In addition, the significant finding of this study regarding improved CHL occurred precisely in the subgroup that needs interpreters.

After all, our study indicates that an extended postnatal home visiting program, as an interventional method, can have the capacity to improve parents' CHL in vulnerable groups. Further studies, using qualitative, quantitative, and mixed methods, are suggested to better understand what can most effectively improve parents' CHL and further child health in vulnerable groups.

Conclusions

Postnatal home visiting interventions may reduce inequity in CHL for parents living in multicultural, socioeconomically disadvantaged settings. Further studies about home visiting programs' potential to improve parents' CHL in similar settings are needed in this underexplored research field.

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