


Media use in gynecological and obstetric care and women's perceived level of education received of lifestyle-related risks: A cross-sectional study

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Abstract

Objective: The application of media on lifestyle-related risk factors (LRRFs) by healthcare providers to educate women may improve women's adherence, health literacy, and awareness of LRRFs, as well as offspring's health outcomes. This study investigated whether exposure to media-based education in gynecological and obstetric care is associated with LRRFs perceived levels of education received during pregnancy and lactation.

Methods: We conducted a cross-sectional, observational study across 14 randomly generated sample points in the 12 most populated cities in Baden-Württemberg, southwest Germany. Women were recruited from gynecological and obstetric institutions. Participants were 219 women who met our inclusion criteria and completed the quantitative questionnaire. We applied ordinal logistic regression analyses to calculate odds ratios (ORs) and 95% confidence intervals (CIs) of women's perceived level of education received related to healthcare providers' exposure to media-based education.

Results: Media-based education on LRRFs during pregnancy through gynecologists and/or midwives were significantly associated with women's perceived level of education received (gynecologists: OR = 4.26 (95% CI: 2.04, 8.90; $p < .001$); midwives: OR = 3.86 (95% CI: 1.66, 8.98; $p = .002$)). Similar results were found for media-based education through gynecologists and/or midwives on LRRFs during lactation and its association with women's self-assessed level of perceived level of education received (gynecologists: OR = 4.76 (95% CI: 2.15, 10.56; $p < .001$); midwives: OR = 7.61 (95% CI: 3.13, 18.53; $p < .001$)).

Conclusions: This study suggests that the exposure to media-based education in gynecological and obstetric care increases women's perceived level of education received of LRRFs during pregnancy and lactation. Therefore, it is recommendable to apply media in gynecological and obstetric care settings.

Keywords

health education, lactation, lifestyle risk reduction, mass media, pregnancy

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Introduction

Health-related behaviors, including alcohol consumption, tobacco smoking, stress, unhealthy diet, and malnutrition are lifestyle-related risk factors (LRRFs) that play a major role in the development of non-communicable diseases (NCDs).^{1–6} In 2017, 91.3% of deaths in the European Union could be attributed to NCDs.⁴ According to the World Health Organization (WHO)¹, LRRFs are of specific harm in highly sensitive periods, such as pregnancy and lactation.

Several systematic reviews have demonstrated the negative effects of LRRFs during pregnancy and lactation on short- and long-term outcomes in the health of offspring.^{5–7} According to the 2019 Drug and Addiction Report,⁸ 31% of the 1,503 surveyed pregnant German women consumed alcohol during pregnancy. Prenatal alcohol exposure risks the development of fetal alcohol syndrome (FAS) or fetal alcohol spectrum disorders (FASD).^{9–12} In Germany, approximately 10,000 newborns experience FAS or FASD each year.¹³ Postnatal alcohol exposure during lactation can, among other things, negatively affect offspring's sleep patterns and the milk ejection reflex.¹⁴

In 2018, 10.9% of the surveyed German mothers (of 4,838 children) smoked during pregnancy.¹⁵ A prior review demonstrates that 50%–80% of mothers resume smoking six months after delivery.⁷ Prenatal tobacco smoke exposure is associated with reduced head size, reduced femur length, low birth weight, and congenital birth defects (e.g. cardiovascular or musculoskeletal).¹⁶ Nicotine consumption shortens the periods of lactation, reduces milk volume, and changes its composition.⁷

In 2016, a “stress-survey” was carried out in Germany in which 1,200 German-speaking people aged 18 and above were asked about their perception and level of stress.¹⁷ According to this study, childbearing-aged women (≤ 49 years)¹⁸ experience stress (aged 18–29 years: 67%; aged 30–39 years: 82%) because of multiple strains like career, children, and supporting one's own parents.¹⁷ In the first postpartum year, 6.5%–12.9% develop minor or major depressions.¹⁹ Stress during pregnancy can cause asthma, allergic diseases,⁶ obesity, and sleep and eating disorders in offspring.^{10,20} Stress can also negatively influence lactation duration, thus reducing healthy nutrients in the milk and lowering the prevention of diseases.^{21,22}

In 2017, 43.1% of women with a desire for children were overweight (body mass index (BMI) ≥ 25 kg/m²) and 14.6% (BMI ≥ 30 kg/m²) obese.²³ Maternal overweight or obesity can cause neurodevelopmental problems in offspring, such as attention deficits and hyperactivity.²⁴ Candido et al.²⁵ observed in their systematic review an insufficient iodine intake in pregnant women worldwide. Insufficient iron intake as well as malnutrition in general, such as vitamin B12, vitamin D, or iodine deficiency during pregnancy can lead to higher risks of preterm birth or

negatively influence offspring language, motor, neurological, and brain development.^{26–28}

Most LRRFs during pregnancy and lactation and their adverse health effects are avoidable. Therefore, there is an urgent need to raise risk awareness among pregnant and lactating women, women of childbearing age, and future parents.²⁹ Informing and educating patients about medical treatments or healthcare prevention results in better health outcomes, increased adherence, and improved health literacy.^{30–35} Healthcare providers can use different types of digital (e.g. videos, apps) and print (e.g. books, brochures) media to educate their patients, visualize information, and strengthen knowledge in (digital) face-to-face settings.^{31,32,34–38} The combination of verbal and written health information improves patients' knowledge and satisfaction.^{39,40} This study investigated whether exposure to media in gynecological and obstetric care is associated with perceived levels of education received of LRRFs during pregnancy and lactation.

Methods

The study received ethical approval from the ethics committee of the Medical Faculty of the University of Heidelberg on 5 May 2019 (S-289/2019). Participants provided informed consent and the study followed all ethical standards, as established in the Declaration of Helsinki.

Study design

We developed a quantitative, literature-based eight-page questionnaire on the awareness, preferences, barriers, and problems of media use in gynecological and obstetric care, as well as socio-demographics in German. We created a focus group with experts (gynecologists and midwives) and discussed with the group members the plausibility of every single question for the concept it aims to measure prior to surveying women to receive logical validity as captured by face validity.

Random selection of participating practices and hospitals was computer-generated. AOK Baden-Württemberg (a statutory health insurance company) contacted 147 institutions via mail or e-mail. Fourteen of the contacted institutions granted permission to survey female patients or clients in their gynecological or obstetric institution. We recruited eligible women in different settings and institutions of gynecological and obstetric care in Baden-Württemberg, Germany, from October 1 to November 15, 2019.

Participating pregnant and breastfeeding women, as well as the participating women of childbearing age, were informed verbally and in writing before the interview started. Informed consent was obtained by inserting the questionnaire into a box. Withdrawal from the survey was possible at any time and without giving reasons until the

questionnaire was inserted into a box. Withdrawal was no longer possible after the questionnaire was inserted into a box.

The study design and methods of this cross-sectional multi-center study were published in detail by Bombana et al.⁴¹

Study population

The study population comprised pregnant and lactating women as well as women of childbearing age (≤ 49 years).¹⁸ Only women of legal age (≥ 18 years) were authorized to participate in the survey. After random selection of gynecological and obstetric institutions, eligible women were recruited in the following settings: waiting room, tour of delivery and maternity ward, prenatal classes, and parents' evenings in hospitals.

A total of 252 questionnaires were distributed to women who met the inclusion criteria, and 220 women completed it. Thirty-two women declined to participate and one woman did not meet the inclusion criteria. A total of 219 women (87.3% response rate) were included in our study.

Variables

Dependent variables. This study focuses on four outcome measures:

1. Women's perceived level of education received of LRRFs during pregnancy through information provided by their gynecologists,
2. Women's perceived level of education received of LRRFs during pregnancy through information provided by their midwives,
3. Women's perceived level of education received of LRRFs during lactation through information provided by their gynecologists, and
4. Women's perceived level of education received of LRRFs during lactation through information provided by their midwives.

Therefore, surveyed women answered four questions:

1. "How well do you feel yourself educated about health-related behaviors during pregnancy through information provided by your gynecologist?"
2. "How well do you feel yourself educated about health-related behaviors during pregnancy through information provided by your midwife?"
3. "How well do you feel yourself educated about health-related behaviors during lactation through information provided by your gynecologist?"
4. "How well do you feel yourself educated about health-related behaviors during lactation through information provided by your midwife?"

Possible answer categories were "very well", "well", "moderately", "rarely", "less well", and "not." Based on sensitivity analyses and to increase statistical power, we decreased the number of response categories and categorized the responses on the perceived level of education received into the following three categories: "very well", "well" (combining "well" and "moderately"), and "less well" (combining "rarely", "less well", and "not") (Although, the perceived level of education received would be usually measured as "very high", "high", and "low"; the answering categories are defined as "very well", "well", and "less well" because these comply with the originally asked question and the way how the women answered.).

Independent variables. We assessed gynecologists' and midwives' media use on LRRFs during pregnancy and lactation by questioning:

- "Does your gynecologist apply media in the education on LRRFs during pregnancy?"
- "Does your midwife apply media in the education on LRRFs during pregnancy?"
- "Does your gynecologist apply media in the education on LRRFs during lactation?"
- "Does your midwife apply media in the education on LRRFs during lactation?"

Possible answer categories were "yes" and "no."

A further independent variable investigated the number of media used by gynecologists and/or midwives. The term "media" was defined as a digital or analog medium which can be used to educate women on health issues by their health care provider. This variable was created by questioning women on the following different types of media with information on pregnancy and/or lactation used by gynecologists and/or midwives: (1) (Internet) addresses of information centers/portals, (2) apps, (3) audio recordings/podcasts, (4) books, (5) film-/video material, (6) flyer, (7) magazines, (8) information brochures, (9) leaflets.

Covariates. We measured the following covariates: current pregnancy (yes or no), current lactation (yes or no), planned future pregnancy (yes or no), planned lactation (yes or no), previous pregnancy (yes or no), previous lactation (yes or no), number of biological children, age (in years), socioeconomic status (SES; Winkler's index; low, middle, high), ethnicity (German, non-German), and firm relationship (yes or no).⁴²

SES was measured using Winkler's index, which was readjusted for the KiGGS study.^{43,44} Winkler's index is a widely used social class index, based on the validated "Scheuch index" and is defined and measured by the net income, the basic and the vocational education, and the

profession.^{45,46} The criteria are included equally in the index calculated as a point sum score. The variable is derived from the main wage earner in the household and categorized into “high, middle, and low”. Further details of the measurement and classification have been reported elsewhere.^{45,46}

As a proxy for ethnicity, we used the country of birth of the individual and both parents. If at least one parent was born abroad, the person was considered non-German. In cases of mixed origin, the mother's country of birth prevailed.⁴⁵

Statistical analysis

In the first step, descriptive analyses were performed, including frequencies in percentages and means (M) with standard deviations (SDs) to investigate sample characteristics. Second, the association of the use of media by gynecological and obstetric healthcare providers on information about pregnancy and/or lactation and the women's perceived level of education received of LRRFs during pregnancy and lactation was measured using ordinal logistic regressions. Therefore, for each independent variable, a crude model without control variables was calculated. Third, for each of the mentioned combinations of dependent and main independent variables, we adjusted each model for the mentioned covariates and calculated the Wald statistics for the full model. Thus, the full models were adjusted for the following covariates: current pregnancy/lactation, previous pregnancy/lactation, planned pregnancy or lactation, number of biological children, age, SES, ethnicity, and firm relationship. To describe the model's fit, we calculated the Nagelkerke's R^2 (N^2) and likelihood ratio tests. All statistical analyses were conducted using SPSS Statistics 26.0[®] (IBM[®], Armonk, NY, USA).

Results

Sample characteristics are shown in Table 1.

Tables 2 and 3 show, among the multivariate OLR, the association between women's perceived level of education received of LRRFs during pregnancy as provided by their gynecologist and/or midwife and the gynecologist's and/or midwife's use of media on pregnancy/lactation. Among the surveyed women who answered that their gynecologist used media when educating them on pregnancy issues, 38.2% indicated a “very well”, 55.5% indicated a “well”, and 6.4% indicated a “less well” perceived level of education received of LRRFs during pregnancy as provided by their gynecologist. Similarly, among the surveyed women who answered that their gynecologist did not use media when educating them on pregnancy issues, 16.0% indicated a “very well”, 61.7% indicated a “well”, and 22.3% indicated a “less well”

Table 1. Sample characteristics with Mean (SD) and Percentage (N).

Characteristics ^a (N=219)	Total ^b
Current fertility	
Currently pregnant (yes)	57.8 (126)
Currently lactating (yes)	17.1 (37)
Planned fertility	
Planned pregnancy (yes)	60.6 (126)
Planned lactation (yes)	87.4 (180)
Previous fertility	
Previously pregnant (yes)	46.1 (100)
Number of biological children	0.69 ± 0.92
Previously lactating (yes)	35.9 (78)
Firm relationship (yes)	91.7 (176)
Age	30.97 ± 5.52
Socioeconomic status	
Low	12.1 (22)
Middle	41.8 (76)
High	46.2 (84)
Ethnicity ^c	
German	72.5 (129)
Non-German	27.6 (49)
Health insurance	
Private	14.8 (27)
Statutory	79.1 (144)
Others	5.5 (10)
None	0.5 (1)

^aData presented as percentage (number) except for number of biological children and age, which are presented as mean (standard deviation).

^bData were missing for currently pregnant (n=1), currently lactating (n=2), planned pregnancy (n=11), planned lactation (n=13), previously pregnant (n=2), number of biological children (n=30), previously lactating (n=2), firm relationship (n=27), age (n=26), socioeconomic status (n=37), ethnicity (n=41), health insurance (n=37). Values are percentages for categorical factors or means (with standard deviations) for continuous factors.

^cThe non-German group is composed of Slavic (n=17), Turkish (n=6) and other ethnic groups (n=26).

perceived level of education received of LRRFs during pregnancy as provided by their gynecologist ($p < .001$). Among the surveyed women who answered that their midwife used media when educating them on pregnancy issues, 48.3% indicated a “very well”, 50.0% indicated a “well”, and 1.7% indicated a “less well” perceived level of education received of LRRFs during pregnancy as provided by their midwives. Among the surveyed women who answered that their midwife did not use media when educating them on pregnancy issues, 36.5% indicated a “very well”, 45.9% indicated a “well”, and 17.6% indicated a “less well” perceived level of education received of LRRFs during pregnancy as provided by their midwives ($p = .002$).

Among the surveyed women who answered that their gynecologist used media when educating them on lactation issues, 27.1% indicated a “very well”, 49.2% indicated a

Table 2. Multivariate ordinal logistic regression models on the relationship between women's perceived level of education received of LRRFs during pregnancy and healthcare providers' media use—full model.

Independent variable ^a	Perceived level of education received of LRRFs ^b during pregnancy as provided by the gynecologist				Perceived level of education received of LRRFs ^b during pregnancy as provided by the midwife							
	Less well ^c	Well ^c	Very well ^c	OR ^d	95% CI ^e	p value ^f	Less well ^c	Well ^c	Very well ^c	OR ^d	95% CI ^e	p value ^f
Gynecologist's/midwife's media use on LRRFs during pregnancy^g												
Yes	6.4 (7)	55.5 (61)	38.2 (42)	4.26	2.04–8.90	<.001	1.7 (1)	50.0 (30)	48.3 (29)	3.86	1.66–8.98	.002
No ^h	22.3 (21)	61.7 (58)	16.0 (15)	1.00			17.6 (15)	45.9 (39)	36.5 (31)	1.00		
Currently pregnant												
Yes	9.8 (12)	55.3 (68)	35.0 (43)	5.96	2.37–14.99	<.001	9.5 (9)	49.5 (47)	41.1 (39)	4.45	1.36–14.57	.014
No ^h	19.8 (16)	63.0 (51)	17.3 (14)	1.00			11.7 (7)	48.3 (29)	40.0 (24)	1.00		
Planned pregnancy												
Yes	13.6 (16)	63.6 (75)	22.9 (27)	0.92	0.42–2.02	.834	13.5 (12)	55.1 (49)	31.5 (28)	0.49	0.18–1.30	.151
No ^h	13.2 (10)	53.9 (41)	32.9 (25)	1.00			6.9 (4)	39.7 (23)	53.4 (31)	1.00		
Previously pregnant												
Yes	11.6 (11)	56.8 (54)	31.6 (30)	1.86	0.69–5.03	.222	10.7 (9)	41.7 (35)	47.6 (40)	0.59	0.19–1.79	.348
No ^h	15.6 (17)	59.6 (65)	24.8 (27)	1.00			10.0 (7)	58.6 (41)	31.4 (22)	1.00		
Number of biological children	0.58 ± 0.95	0.73 ± 1.00	0.73 ± 0.77	1.28	0.69–2.38	.435	0.73 ± 1.03	0.75 ± 1.01	1.04 ± 0.88	1.90	0.95–3.81	.070
Firm relationship												
Yes	11.8 (20)	57.6 (98)	30.6 (52)	1.44	0.38–5.42	.590	10.9 (14)	50.0 (64)	39.1 (50)	0.70	0.12–4.00	.684
No ^h	40.0 (6)	53.3 (8)	6.7 (1)	1.00			11.1 (1)	55.6 (5)	33.3 (3)	1.00		
Age	28.73 ± 6.54	31.58 ± 5.11	31.81 ± 5.00	1.06	0.99–1.14	.108	31.53 ± 5.81	31.56 ± 4.23	33.08 ± 5.25	1.05	0.96–1.15	.299
Socioeconomic status												
Low	26.3 (5)	57.9 (11)	15.8 (3)	1.82	0.53–6.27	.345	15.4 (2)	53.8 (7)	30.8 (4)	1.22	0.28–5.25	.792
Moderate	9.5 (7)	58.1 (43)	32.4 (24)	2.81	0.83–9.51	.097	1.8 (1)	45.5 (25)	52.7 (29)	5.67	1.27–25.21	.023
High ^h	13.3 (11)	61.4 (51)	25.3 (21)	1.00			18.5 (12)	53.8 (35)	27.7 (18)	1.00		
Ethnicity												
German	12.2 (15)	60.2 (74)	27.6 (34)	1.13	0.53–2.41	.753	7.5 (7)	52.7 (49)	39.8 (37)	2.25	0.94–5.39	.069
Not German ^h	16.7 (8)	54.2 (26)	29.2 (14)	1.00			21.6 (8)	48.6 (18)	29.7 (11)	1.00		
N ²ⁱ	0.30						0.33					
N	156						114					

^aData presented as percentage (number) except for the number of biological children and age, which are presented as mean (standard deviation).

^bLRRF=lifestyle-related risk factor.

^c1 = less well, 2 = well, 3 = very well.

^dodds ratio.

^eCI=95% confidence interval.

^fp-values are derived from the Wald test, calculated in multivariate ordinal logistic regressions.

^gTo investigate the perceived level of education received of LRRFs during pregnancy as provided by the gynecologist, the variable on gynecologist's media use on LRRFs during pregnancy is applied; to investigate the perceived level of education received of LRRFs during pregnancy as provided by the midwife, the variable on midwife's media use on LRRFs during pregnancy is applied.

^hReference category.

ⁱN²=Nagelkerke's R².

Table 3. Multivariate ordinal logistic regression models on the relationship between women's perceived level of education received of LRRFs during lactation and healthcare providers' media use—full model.

Independent variable ^a	Perceived level of education received of LRRFs ^b during lactation as provided by the gynecologist				Perceived level of education received of LRRFs ^b during lactation as provided by the midwife							
	Less well ^c	Well ^c	Very well ^c	OR ^d	95% CI ^e	p value ^f	Less well ^c	Well ^c	Very well ^c	OR ^d	95% CI ^e	p value ^f
Gynecologist's/midwife's media use on LRRFs during lactation^g												
Yes	23.7 (14)	49.2 (29)	27.1 (16)	4.76	2.15–10.56	<.001	6.9 (4)	37.9 (22)	55.2 (32)	7.61	3.13–18.53	<.001
No ^h	55.2 (64)	35.3 (41)	9.5 (11)	1.00			28.6 (22)	44.2 (34)	27.3 (21)	1.00		
Currently lactating												
Yes	38.2 (13)	41.2 (14)	20.6 (7)	0.79	0.27–2.33	.662	8.8 (3)	35.3 (12)	55.9 (19)	0.84	0.25–2.78	.775
No ^h	47.3 (71)	38.7 (58)	14.0 (21)	1.00			21.1 (24)	43.0 (49)	36.0 (41)	1.00		
Planned lactation												
Yes	49.0 (75)	38.6 (59)	12.4 (19)	1.22	0.38–3.91	.741	20.7 (25)	43.0 (52)	36.4 (44)	1.60	0.41–6.23	.496
No ^h	34.8 (8)	43.5 (10)	21.7 (5)	1.00			14.3 (3)	33.3 (7)	52.4 (11)	1.00		
Previously lactating												
Yes	34.2 (25)	46.6 (34)	19.2 (14)	1.90	0.58–6.21	.290	5.6 (4)	39.4 (28)	54.9 (39)	2.68	0.71–10.09	.145
No ^h	53.2 (59)	34.2 (38)	12.6 (14)	1.00			28.6 (22)	44.2 (34)	27.3 (21)	1.00		
Number of biological children	0.55 ± 0.91	0.91 ± 1.00	1.04 ± 0.79	1.20	0.58–2.45	.626	0.38 ± 0.82	0.87 ± 1.07	1.22 ± 0.82	1.05	0.47–2.37	.899
Firm relationship												
Yes	41.6 (64)	42.2 (65)	16.2 (25)	2.63	0.58–11.94	.212	18.3 (23)	40.5 (51)	41.3 (52)	0.63	0.11–3.74	.607
No ^h	69.2 (9)	23.1 (3)	7.7 (1)	1.00			12.5 (1)	62.5 (5)	25.0 (2)	1.00		
Age	30.88 ± 5.88	31.78 ± 5.00	32.15 ± 4.99	1.06	0.99–1.15	.107	30.62 ± 5.27	32.48 ± 4.71	32.59 ± 5.02	1.08	0.99–1.19	.097
Socioeconomic status												
Low	52.9 (9)	29.4 (5)	17.6 (3)	0.65	0.15–2.83	.561	23.1 (3)	46.2 (6)	30.8 (4)	0.69	0.13–3.62	.663
Moderate	38.6 (27)	44.3 (31)	17.1 (12)	1.25	0.29–5.41	.763	9.4 (5)	39.6 (21)	50.9 (27)	2.08	0.40–10.81	.382
High ^h	49.3 (36)	39.7 (29)	11.0 (8)	1.00			27.4 (17)	43.5 (27)	29.0 (18)	1.00		
Ethnicity												
German	48.1 (52)	38.0 (41)	13.9 (15)	0.57	0.26–1.25	.162	14.6 (13)	43.8 (39)	41.6 (37)	1.56	0.61–3.98	.356
Not German ^h	44.4 (20)	40.0 (18)	15.6 (7)	1.00			32.4 (12)	37.8 (14)	29.7 (11)	1.00		
N ²ⁱ	0.26						0.39					
N	134						103					

^aData presented as percentage (number) except for the number of biological children and age, which are presented as mean (standard deviation).

^bLRRF=lifestyle-related risk factor.

^c1 = less well, 2 = well, 3 = very well.

^dodds ratio.

^eCI = 95% confidence interval.

^fp-values are derived from the Wald test, calculated in multivariate ordinal logistic regressions.

^gTo investigate the perceived level of education received of LRRFs during lactation as provided by the gynecologist, the variable on gynecologist's media use on LRRFs during lactation was applied; to investigate the perceived level of education received of LRRFs during lactation as provided by the midwife, the variable on midwife's media use on LRRFs during lactation was applied.

^hReference category.

ⁱN² = Nagelkerke's R².

“well”, and 23.7% indicated a “less well” perceived level of education received of LRRFs during lactation as provided by their gynecologist. Similarly, among the surveyed women who answered that their gynecologist did not use media when educating them on lactation issues, 9.5% indicated a “very well”, 35.3% indicated a “well”, and 55.2% indicated a “less well” perceived level of education received of LRRFs during lactation as provided by their gynecologist ($p < .001$). Among the surveyed women who answered that their midwives used media when educating them on lactation issues, 55.2% indicated a “very well”, 37.9% indicated a “well”, and 6.9% indicated a “less well” perceived level of education received of LRRFs during lactation as provided by their midwives. Similarly, among the surveyed women who answered that their midwife did not use media when educating them on lactation issues, 27.3% indicated a “very well”, 44.2% indicated a “well”, and 28.6% indicated a “less well” perceived level of education received of LRRFs during lactation as provided by their midwife ($p < .001$).

The multivariate OLR analyses in Table 2 show that the probability of a higher perceived level of education received of LRRFs during pregnancy through the gynecologist significantly increased ($p < .001$) by an OR of 4.26 (95% CI: 2.04, 8.90) when the gynecologist used media to educate women on LRRFs during pregnancy as compared to no media use. We identified a large effect size (Cohen’s $d=0.8$). The probability of a higher perceived level of education received of LRRFs during pregnancy through the midwife significantly increased ($p = .002$) by an OR of 3.86 (95% CI: 1.66, 8.98) when the midwife uses media to educate women on LRRFs during pregnancy as compared to no media use (large effect size: Cohen’s $d=0.75$).

The multivariate OLR analyses in Table 3 show that the probability of a higher perceived level of education received of LRRFs during lactation through the gynecologist significantly increased ($p < .001$) by an OR of 4.76 (95% CI: 2.15, 10.56) when the gynecologist used media to educate women on LRRFs during lactation as compared to no media use (large effect size: Cohen’s $d=0.86$). The probability of a higher perceived level of education received of LRRFs during lactation through the midwife significantly increased ($p < .001$) by an OR of 7.61 (95% CI: 3.13, 18.53) when the midwife used media to educate women on LRRFs during lactation as compared to no media use (very large effect size: Cohen’s $d=1.12$).

The multivariate logistic regression analysis of the relationship between women’s perceived level of education received of LRRFs during pregnancy and the number of used media showed that the number of media used significantly increased with increasing perceived levels of education received of LRRFs (gynecologists OR = 1.61 (95% CI: 1.23, 2.11), $p < .001$; midwives OR = 1.68 (95% CI: 1.10, 2.58), $p = .017$). Similarly, the average number of

media used by gynecologists and midwives on LRRFs during lactation significantly increased with increasing perceived levels of education received of LRRFs (gynecologists OR = 1.60 (95% CI: 1.19, 2.15), $p = .002$; midwives OR = 2.19 (95% CI: 1.47, 3.25), $p < .001$) (Data are available on request from the corresponding author).

Discussion

Main findings

Our study demonstrates that exposure to media-based education on LRRFs during pregnancy and lactation through gynecologists and/or midwives was associated with a higher perceived level of education received of LRRFs during pregnancy and lactation. An increasing number of media used by gynecologists and/or midwives has been associated with an increasing perceived level of education received through the gynecologist and/or midwife on LRRFs during pregnancy and lactation.

Strengths and limitations

To the best of our knowledge, this is the first study to investigate the effect of media-based education on women’s perceived level of education received of LRRFs during pregnancy and lactation. We randomly generated sample points across different obstetric and gynecological care institutions. As women from the lower social class are generally less likely to participate in surveys as compared to women in the middle and high social class, and are a relevant population group in our study,^{47,48} we created an oversampling of sample points in socially disadvantaged districts, representing 12.7% of the total study population. The content and reporting of the study followed high standards as captured in the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Checklist.⁴⁹

The small number of cases included in our study is a major limitation. Therefore, the results of our study should be interpreted with caution. The preliminary results of our study should be verified in a larger study.

“Perceived level of education received” is a subjective measurement. Therefore, we need to consider that these subjective assessments might be confounded by variables that we could not control. Furthermore, the ORs showed a large effect size, but their practical relevance has not been verified in this study. Thus, it remains unclear whether this effect is sufficient to achieve a change in women’s behavior.

Understanding of health-related behaviors was not explained and surveyed in detail, and accordingly, women’s understanding of LRRFs might vary. Moreover, we lack information on the form of health education. Health education may differ across gynecological and obstetric

healthcare institutions and the intensity and content of health education are unknown. Further research should investigate the practice of health education on LRRFs in gynecological and obstetric care. Among the surveyed women, 37 were currently neither pregnant nor lactating; however, they planned on a pregnancy in the future. Therefore, we assume that the identified association between healthcare provider's application of media in the education of LRRFs on women's perceived level of education received of LRRFs during pregnancy might be even stronger in a population that includes only pregnant and/or lactating women.

The study's sample points are located in Baden-Württemberg; therefore, the results are not representative of other federal states or the whole German country.

Interpretation

The results from our study show that the application of media in the education of LRRFs in gynecological and obstetric care are associated with higher perceived levels of education received about pregnancy and lactation. A systematic review showed that media-based patient education on anesthesia is an effective tool to increase patients' knowledge and satisfaction and to decrease anxiety.⁵⁰ Two systematic reviews concerning patients with diabetes showed that patient education in general increases knowledge of glycemic control in patients with type 2 diabetes.^{51,52} Chrvala et al.⁵¹ reported that patients' education leads to reductions in diabetic ulcers and amputation as long-term outcomes. Dorresteijn et al.,⁵² however, described the positive short-term effects of patients' education on patient behavior. A systematic review on the effects of patient education and self-management interventions in patients with psoriasis provides limited evidence only.⁵³ Thus, the results were inconsistent across studies.

However, little is known about media-based patient education in gynecological and obstetric care. A Cochrane systematic review on individual or group antenatal education for childbirth or parenthood or both concluded that the effects remain unknown.⁵⁴ Moreover, individualized prenatal education directed toward avoidance of a repeat cesarean birth did not increase the rate of vaginal birth after cesarean section.⁵⁴

In general, the readability and comprehensibility of a particular medium in patient education are essential to reach people across all educational levels.^{55–57} Simplification and application of media during gynecological and obstetric consultation might increase its effectiveness.^{55,58}

Gynecologists' and midwives' application of media on LRRFs during pregnancy and lactation are associated with higher perceived levels of education received. This implies that healthcare providers in gynecological and obstetric care should apply media during patients' education in their daily consultation routines. Therefore, creating and providing evidence-based gynecological and obstetric media

for healthcare providers is urgently needed. Future research should focus on the development and evaluation of applying media in gynecological and obstetric care.

Conclusion

Our findings coincide with other studies on the effect of media-based patient education on perceived levels of education received. However, this study is the first to demonstrate a positive association between media use in gynecological and obstetric care and women's perceived level of education received of LRRFs. Our preliminary results need to be verified using a larger sample.

Authors' Note

M.B., Ma.W., C.U., and M.W. conceived the hypotheses and designed the study. Ma.W. performed the experiments and data collection. Ma.W., M.B., G.M., and M.H.G. performed the data analysis. M.B. and Ma.W. performed writing and original draft preparation. M.B., Ma.W., G.M., M.H.G., C.U., and M.W. contributed to the interpretation of the data, edited and critically revised the manuscript, approved the final version of the manuscript, and agreed to the published version of the manuscript. All persons who qualify for authorship are listed, and all persons designated as authors qualify for authorship.

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Author contribution(s)

Manuela Bombana: Conceptualization; Formal analysis; Investigation; Methodology; Project administration; Supervision; Validation; Writing—original draft; Writing—review & editing.

Michel Wensing: Conceptualization; Writing—review & editing.

Gerhard Müller: Conceptualization; Methodology; Validation; Writing—review & editing.

Charlotte Ullrich: Conceptualization; Writing—review & editing.

Monika Heinzl-Gutenbrunner: Formal analysis; Validation; Writing—review & editing.

Maren Wittek: Data curation; Formal analysis; Visualization; Writing—original draft.

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Supplemental material

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