The Students' Attitudes Towards Women'S Childbirth Experience - Development and Validation of a Questionnaire for Health Sciences Students (Cave-St)

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Abstract

BACKGROUND: The purpose of this study is to report on the validation process of the Spanish version of a questionnaire that explores health science students' attitudes towards women's childbirth experiences. This questionnaire could help inform education programs to enhance the quality of woman-professional interactions, and to improve women's experiences of childbirth.

METHODS: A standardised procedure for the development and validation of the questionnaire included: item development and psychometric pre-validation, Cronbach's Alpha and split-half coefficients calculation, test-retest and item-total correlation for the reliability analysis. Content validity was undertaken by Delphi method with sixteen panelists over two rounds. We determined the factor structure and refined and validated the questionnaire according to the responses of a cohort of 160 students using principal components factor analysis with varimax rotation.

RESULTS: A 52-items questionnaire CAVE-st: (acronym for *cuestionario de actitudes sobre vivencias y experiencias en el parto*) was developed and validated. The questionnaire had a high construct validity, with a Cronbach's alpha > 0.92. The intraclass correlations (0.80) indicated adequate test-retest reliability. The results of the exploratory factor analysis revealed fourteen latent components that explained more than the 70% of the observed total variance.

CONCLUSIONS: The Spanish version of the questionnaire CAVE-st has been developed and validated. Its psychometrics indicate that it is a valid and reliable tool to assess health sciences students' attitude towards women's childbirth experience. Further work to translate and adapt the instrument in other cultures and languages will be undertaken.

Background

Beyond strictly clinical aspects, the content and the quality of interpersonal communication between health professionals and patients is directly related to patient care-related outcomes (1). In the experience of childbirth, aside from women being provided with insights into objective complications, women's perception of the verbal and non-verbal behaviours that health care providers display impacts on their experience of pregnancy and childbirth (2). A growing body of research reports that inadequate—sometimes disrespectful, abusive or even violent—care during pregnancy, childbirth or the postpartum period are specific risk factors for birth-related trauma (3–6). Many women remember childbirth as an adverse event, between 10–48% recall it as a traumatic event, and 1–6% go on to develop post-traumatic stress disorder (7–11); with poor interactions with care providers identified as a key cause of women's frustration and psychological distress (5). While some variables related to women's negative experiences of childbirth, such as perinatal psychological distress, depression and other mood disorders, are often of unknown and unpredictable etiology, those related to interpersonal interactions with health professionals are modifiable, and can be improved (12).

The World Health Organization (13) highlights the need to direct efforts and educational resources towards improving the quality of perinatal care and eliminating inappropriate practices, urging that women must be respected, informed and involved in the decision making process during pregnancy and childbirth. To achieve this aim, graduate and postgraduate health science students need to acquire clinical skills, as well as interpersonal skills that include how to provide empathic, dignified and respectful care with pregnant and postnatal women (14, 15). While methods to teach clinical and technical skills into the physiology and pathophysiology of pregnancy and childbirth are generally straightforward, how to improve the quality of woman-provider interactions is less developed. Health professionals' underlying attitudes, and understanding of the needs of pregnant and laboring women play a key role in terms of how care is provided (5). This therefore raises important questions as to what information healthcare students receive as part of their professional training, and whether further psychosocial education is needed.

The aim of this study is to report on the validation process of the Spanish version of a questionnaire to explore graduate and postgraduate health sciences students (nursing, midwifery, obstetrics, paediatrics, etc) attitudes towards women's childbirth experiences. It was considered that this questionnaire could help identify important insights into how health sciences education programs could be improved, and ultimately to help improve women's experiences of childbirth.

Methodology

Questionnaire development

As there was no existing questionnaire in this area, we consulted with academics and clinicians from various European universities (Spain, Iceland, Lithuania, Portugal, Turkey and UK) who proposed a total of 100 items for the new instrument. The selection of items was based on current research, best practice guidelines in childbirth care, and experts' professional and academic backgrounds. The experts included researchers and lecturers in the fields of nursing, midwifery, psychology, anthropology, medicine and perinatal care. After all items had been collected, these were re-shared for further discussion and for their suitability to be assessed.

The items were then grouped into key categories: knowledge about care and attention during normal childbirth; beliefs about pain during delivery; autonomy and authority of the mother; priorities related to optimising the foetus's well-being; support during delivery; professional interactions with laboring women including authorization to intervene, respecting women's decisions, respecting women's physiology and the need to identify oneself as a student; knowledge of the factors that cause obstetric trauma; ability to identify birth trauma, and feelings towards the mother during labour. In order to develop a common tool, a decision was made to validate the standard version in Spanish and later adapt it to other cultures and languages.

Delphi Method

A consensus Delphi approach was used to validate the questionnaire (16, 17). A panel of experts from multi-professional backgrounds were appointed to analyse the coherence, clarity and relevance of the proposed items, and to suggest other relevant items that had not been considered. The panel comprised sixteen professionals, including psychiatrists, psychologists, nurses, midwives and gynaecologists, who were of different ages, and from different regions of Spain. All the professionals had a teaching or clinical profile, or both, and all were professionally active.

An online questionnaire was developed, with experts asked to rate all the initial items ($n = 100$) using 5 point Likert scales of strongly disagree/not relevant at all, disagree/not relevant, neutral, agree/relevant, strongly agree/very much relevant. Two rounds of anonymous questionnaires were shared; after the first round, information was provided on the overall results, with experts then asked to rate the list of questions again. Any item which received 80% agreement for any of the three levels of criteria were retained. Further means to assess the clarity of the questions and questionnaire instructions was also undertaken, with an on-line version of the questionnaire tested on a small group of subjects.

Once the questionnaire prototype was completed, the next step was a field test with a larger sample group. All the final-year medical students at the University of Malaga were invited to participate via an internet link to the questionnaire. The Cronbach's alpha coefficient and Gutman's split-half coefficient were used to measure the internal consistency of the scoring of the questionnaire. The ceiling and floor effects were checked, and the items that reduced the overall consistency were excluded.

The reliability of the instrument was undertaken using the test-retest method with students from the University of Malaga. Students were invited to complete the online questionnaire twice, at 14 days apart. The Kaiser Meyer Olkin (KMO) test and the Bartlett's test of sphericity were performed to assess the adequacy of an exploratory factor analysis. An exploratory factor analysis was then conducted using the analysis of the main components of the scale and the Varimax method and orthogonal rotation was used to identify latent factors that explained the observed variance. Figure 1 shows the development and validation process of the questionnaire.

Ethics

Prior authorization to issue the questionnaire to students was obtained from the ethics committee at University of Malaga. When opening the link to the questionnaire, participants were provided with information about the aims and purpose of the study, and how privacy, anonymity, and confidentiality was ensured. Participants were asked to check a box to indicate their consent to participate.

Results

Outcomes from Delphi panel and the assessments

Table 1 shows the main characteristics of the experts that took part in the Delphi method. The average levels of agreement were 80.6, 81.0 and 81.6, and 89.7, 93.5 and 93.7 for clarity, relevance and coherence, in first and second rounds, respectively. During the first round sixteen items were eliminated as they were not considered relevant by $\geq 80\%$ of the experts. After the second round, seven items were eliminated, and the wording of a further four were improved as per the experts' recommendations. Finally, a set of 77 items was obtained which reached an agreement among the panel of 90% for clarity, and 95% for pertinence and relevance. Individual item scores are available in supplementary file 1.

Table 1
Expert pannel profile

Gender	n (%)
Women	12 (75)
Men	4 (25)
Age	1 (6.2)
25 to 34	6 (37.5)
35 to 44	4 (25)
45 to 54	4 (25)
55 to 64	1 (6.2)
≥ 65	
Professional field	6 (37.5)
Midwifery	2 (12.4)
Nursing	5 (31.2)
Obstetrics	2 (12.4)
Psychology	1 (6.2)
Psychiatry	
Professional Practice	11 (68.7)
Clinical in Maternity Hospitals	1 (6.2)
Clinical in Primary Care	4 (25)
University Teaching and Research	

In order to detect problems of interpretation of the prototype and to assess the understanding of the questions and the included instructions, an online version was piloted with 30 subjects (students). Overall feedback was very positive, and no comprehension problems were reported. The prototype was then issued to a further 160 students who were in the final year of a degree in medicine at the University of Malaga. One hundred and 56 students completed the questionnaire (response rate of 97.5%). The average age of the students was 23.9 years (SD 2.0; range 23–37), most of them were women (70.5%) and only two of them had been pregnant and had children. The internal consistency of the 77-item prototype obtained a Cronbach's alpha of 0.83 and a Gutman's split half coefficient of 0.74. Analysis of the correlations between the items and the overall score produced a final 52-item scale, called CAVE-st (acronym for *cuestionario de actitudes sobre vivencias y experiencias en el parto*), with an improved Cronbach's alpha of 0.92 and a Gutman's split half coefficient of 0.85. The Cronbach's coefficient scores based on the inclusion and exclusion of items has been included in supplementary file 2.

The final 52-item version of CAVE-st asked participants to rate their agreement between 1 (completely disagree) and 5 (completely agree) to positively framed questions (item 4, 9, 11–15, 17, 20, 21, 24–45, 49, 51, 52) and between 1 (completely agree) and 5 (completely disagree) to negatively framed questions (item 1–3, 5–8, 10, 16, 18, 19, 22, 23, 46–48, 50). The final CAVE-st score ranges between 52 and 260.

The mean, median and mode scores, the standard deviation and 25th, 50th and 75th percentiles from the sample of 156 students are shown in Table 2. We did not find differences according to the age or gender of respondents.

Table 2
Judges' agreement outcomes in both Delphi rounds. In dark the scores from second round

ITEM	CLARITY	CLARITY	RELEVANCE	RELEVANCE	COHERENCE	COHERENCE	ITEM	CLARITY	CLARITY	RELEVANCE	RELEVANCE
1	75	92.9	78.6	92.9	93.3	93.3	49	75	85.7	86	92.3
2	82	92.9	86.7	93.3	86.7	86.7	50	69	46.7	73	92.9
3	50	57.1	74	100	65	76.9	51	93	100	93	92.9
4	62	71.4	70	85.7	64	76.9	52	75	92.3	79	100
5	75	85.7	86	92.9	64	84.6	53	69	71.4	71	84.6
6	85	85.7	94	100	94	100	54	88	100	86	100
7	56	92.9	80	92.9	71	92.3	55	81	100	86	100
8	80	80	79	92.3	79	92.3	56	87	100	93	100
9	86	85.7	86	92.9	86	92.3	57	69	78.6	71	92.3
10	81	85.7	86	100	79	100	59	75	80	71	84.6
11	81	86.7	71	84.6	71	92.3	60	69	71.4	79	92.9
12	75	86.7	71	76.9	71	92.3	61	69	85.7	79	85.7
13	81	92.9	87	92.9	81	100	62	62	85.7	80	92.3
14	69	71.4	79	92.3	86	100	63	93	92.9	93	92.3
15	81	86.7	79	92.3	79	92.3	64	93	93.3	93	92.3
16	69	71.4	79	92.3	85	85.7	68	93	93.3	80	92.3
17	69	64.3	79	92.3	86	92.9	69	87	93.3	80	92.3
18	88	92.9	87	100	86	92.3	70	75	71.4	73	92.3
19	75	92.9	87	100	86	100	71	81	100	87	100
20	88	100	93	100	93	92.9	73	88	100	87	92.9
21	70	85.7	79	92.3	93	92.9	75	88	100	87	100
22	88	100	93	100	100	92.9	76	94	100	87	100
23	69	64.3	71	92.3	79	92.9	77	88	100	87	100
24	81	78.6	86	85.7	86	84.6	78	88	100	87	92.3
25	81	85.7	79	92.3	79	100	79	94	85.7	100	100
26	81	85.7	80	92.3	86	93.3	80	100	85.7	100	100
27	87	93.3	86	92.3	86	92.3	81	88	100	87	100
28	75	78.6	73	84.6	79	85.7	82	80	80	80	92.3
29	81	86.7	71	84.6	71	100	83	81	100	87	100
31	73	73.3	71	84.6	64	76.9	84	94	100	93	100
32	100	100	100	100	100	100	85	94	100	93	100
33	69	71.4	80	85.7	69	76.9	86	100	100	100	100
34	69	64.3	79	85.7	79	84.6	87	93	100	93	100
36	75	86.7	73	100	73	100	88	62	64.3	73	84.6
37	87	100	87	100	93	100	90	93	100	73	84.6
38	100	100	100	100	100	92.9	95	81	86.7	73	76.9
39	86	85.7	86	92.9	86	100	96	81	80	80	66.7
43	69	85.7	71	100	71	100	97	87	100	93	100
45	69	85.7	80	100	80	100	98	87	100	93	100
46	81	100	80	92.3	80	92.3	99	94	100	93	100
47	75	93.3	73	92.3	71	92.3					

Finally, the test-retest reliability was assessed in a sample of 60 students with a further version of the questionnaire completed two weeks after it was first completed. A Spearman correlation index $r = 0.73$ and a significant intraclass correlation coefficient $r = 0.864$ ($F 7.30$, $df 59$, $p < 0.0001$) confirmed its reliability.

Exploratory factorial analysis

The Kaiser-Meyer-Olkin measure was 0.704 and the Bartlett's test of sphericity was favourable (Chi-Square 2731.90, $df 13780$, $p < 0.0001$). The exploratory factory analysis revealed sixteen components that explained 70.6% of the variance (Tables 3–5). While one of the components (Component 1) explained 21.827% of the total variance, the rest ranged between 5.7% and 1.9%. Table 3 shows the proportion of the total variance explained by each main component. Table 4 includes the distribution of items and their saturation in each component. As shown, components 1 to 16 were defined by a different number of items, with the range from 1–8 items. Component 1 assesses the students' beliefs about the psychosocial factors that could influence women's experience of birth, specifically it consists of 8 items regarding women's mental health, previous obstetric trauma, the perception of support from birth partners, and the role of social, family or economic resources. Component 2 assesses a dimension related to women's empowerment and includes three items about women's consent and the students' idealization of women's physical and psychological strength. Component 3 includes two items that relate to the students' role identity, and the image that they should show to others in perinatal scenarios. Component 4 consists of 6 items regarding students' opinion about the influence of obstetric complications (obstetric haemorrhage, caesarean section, foetal demise, or uncontrollable pain) during labour on women's experience of birth, and birth trauma. Component 5 includes 5 items, that assess the role of hypothetical unexpected events like a preterm birth or a medical diagnosis on women's experience. Component 6 consists of three items that explore the students' attitudes on women's expectations of a normal birth. Component 7 comprises 3 items assessing students' ability to detect and/or prevent a birth trauma. Component 8 assesses the student's attitude towards women's need for accompaniment during birth and includes 3 items. Component 9 consists of 3 items that assess students' ability to empathize with women. Component 10 comprises three items that focus on students' attitudes towards women's decision-making processes during labour. Component 11 consists of five items that evaluate student's attitudes regarding medicalization of birth. Component 12 includes two items that measure the student's self-awareness of how they may influence birth and the responsibility they have towards women. Component 13 consists of 2 items that assess students' respect for women's freedom to choose different alternatives during childbirth. Component 14 comprises 2 items that measure students' attitudes towards how care should be prioritized during childbirth. Components 15 and 16 only included 1 item each, and while these items could have been suitable to group with other components, the statistics identified them as independent factors. In Component 15 the item assessed the role of birth trauma as a risk factor for breastfeeding difficulties, in Component 16, the item assessed student's attitudes towards continuous cardiotocography during normal childbirth. After the analysis, and following logical and clinical criteria, these single items from Components 15 and 16, were added to Components 7 and 11 respectively, in which they also showed moderate saturations. Table 5 shows the correlations between the components, and with overall scores, Table 6 shows the score limits for the global scale and for the 14 components, as well as the distribution of scores in the sample of 156 students. Supplementary file 3 includes the items distribution among the components.

Table 3
Outcomes for the exploratory factorial analysis

Total variance explained									
Components	Initial Eigenvalues			Extraction sums of squared loadings			Rotation sums of squared loadings		
	Total	% of the Variance	Cumulative %	Total	% of the Variance	Cumulative %	Total	% of the Variance	Cumulative %
1	11.568	21.827	21.827	11.568	21.827	21.827	4.303	8.120	8.120
2	3.052	5.759	27.586	3.052	5.759	27.586	3.187	6.013	14.133
3	2.577	4.862	32.448	2.577	4.862	32.448	2.821	5.322	19.455
4	2.131	4.021	36.469	2.131	4.021	36.469	2.808	5.299	24.754
5	2.063	3.893	40.362	2.063	3.893	40.362	2.690	5.075	29.829
6	1.949	3.677	44.039	1.949	3.677	44.039	2.553	4.817	34.646
7	1.869	3.526	47.565	1.869	3.526	47.565	2.321	4.379	39.025
8	1.796	3.389	50.954	1.796	3.389	50.954	2.242	4.231	43.256
9	1.641	3.097	54.051	1.641	3.097	54.051	2.219	4.186	47.442
10	1.527	2.881	56.932	1.527	2.881	56.932	2.015	3.802	51.245
11	1.458	2.752	59.683	1.458	2.752	59.683	2.011	3.795	55.039
12	1.256	2.370	62.053	1.256	2.370	62.053	1.905	3.595	58.634
13	1.225	2.312	64.365	1.225	2.312	64.365	1.697	3.202	61.836
14	1.168	2.203	66.568	1.168	2.203	66.568	1.667	3.145	64.982
15	1.114	2.102	68.670	1.114	2.102	68.670	1.523	2.873	67.855
16	1.030	1.944	70.614	1.030	1.944	70.614	1.463	2.759	70.614
.									

Table 4

Distribution of items and coefficients for each main component in the prototype. (C1: Psychosocial Factors; C2: Women's empowerment; C3: Role identity; C4: Obstetric Trauma; C5: Accompaniment; C6: Empathy; C7: Women's decisions; C8: Medicalization; C9: Commitment

C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11										
79	0.792	38	0.769	32	0.846	14	0.768	84	0.753	53	0.749	61	0.607	23	0.804	18	0.76	46	0.821	2
80	0.743	37	0.745	33	0.727	13	0.64	85	0.681	95	0.669	59	0.456	24	0.637	63	0.526	45	0.541	68
81	0.597	90	0.583		71	0.464	73	0.484	51	0.432	57	0.331	25	0.403	47	0.416	15	0.406	55	
78	0.592				75	0.45	77	0.456											12	
82	0.576				52	0.313	87	0.376											69	
83	0.556				76	0.44													54	
86	0.534																			
62	0.393																			

Table 5

Pearson's correlations coefficients between the components and CAVE st scores (NS: not significant; C1: Psychosocial Factors; C2: Women's empowerment; C3: Role identity; C4: Complications; C5: Unexpected outcomes; C6: Women's expectations; C7: Obstetric Trauma; C8: Accompaniment; C9: Empathy; C10: Women's decisions; C11: Medicalization; C12: Commitment; C13: Respect; C14: Clinical priorities)

	CAVE st	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11	C12	C13	C14
C1. Psychosocial Factors	0.76	1													
C2. Women's empowerment	0.53	0.40	1												
C3. Role identity	0.43	0.18	0.20	1											
C4. Complications	0.60	0.31	NS	0.19	1										
C5. Unexpected outcomes	0.60	0.56	0.20	0.22	0.32	1									
C6. Women's expectations	0.57	0.41	0.24	0.28	0.32	0.27	1								
C7. Obstetric Trauma	0.45	0.19	NS	NS	0.37	0.17	0.27	1							
C8. Accompaniment	0.42	0.23	0.18	0.27	0.24	NS	0.22	NS	1						
C9. Empathy	0.46	0.36	0.36	0.15	NS	0.29	0.26	NS	NS	NS					
C10. Women's decisions	0.40	NS	0.41	0.15	NS	NS	NS	NS	NS	0.37	1				
C11. Medicalization	0.47	0.32	NS	0.17	0.22	0.27	0.19	0.26	NS	NS	NS	1			
C12. Commitment	0.47	0.39	0.26	NS	NS	0.28	0.19	0.17	NS	0.17	0.17	0.28	1		
C13. Respect	0.33	NS	NS	NS	0.24	NS	0.15	0.22	NS	NS	0.17	NS	NS	1	
C14. Clinical priorities	0.29	NS	NS	NS	0.25	NS	NS	0.16	NS	NS	NS	NS	NS	0.25	1

Table 6

CAVE st Scale and its components. Limits and scores in the sample n = 156 students. Min. = Minimum; Max. = Maximum; Std E.M: Standard error of the Mean
Std Dev: Standard Deviation; P: Percentile; Q: Quartile

Scale/Components	Items	Range		Scores (n = 156)												
		Min.	Max.	Min.	Max.	Mode	Median	Mean	Std E.M.	Std Dev	P ₅	P ₁₅	Q ₁	Q ₃	P ₈₅	P ₉₅
CAVE st Scale	GLOBAL SCALE	52	260	172	244	204	204	205.5	10.16	140.55	180	191	195	215	221	233,15
C1. Psychosocial Factors	25; 36; 37; 38; 39; 40; 41; 44	9	45	24	40	31	34	33,91	0.31	3,88	27	30	31	37	38	40
C2. Women's empowerment	11; 12; 49	3	15	8	15	15	13	12,97	0.15	1,87	9	11	12	15	15	15
C3. Role identity	9; 10	3	15	5	10	10	10	8,97	0.11	1,42	6	7	8	10	10	10
C4. Complications	1; 2; 18; 31; 33; 34	5	25	14	30	25	23	22,66	0.22	2,79	18	20	21	25	25	27
C5. Unexpected outcomes	32; 35; 42; 43; 45	4	25	15	25	21	22	21,64	0.17	2,24	18	19	20	23	24	25
C6. Women's expectations	50; 17; 19	3	15	7	15	13	13	12,94	0.13	1,71	10	11	12	14	15	15
C7. Obstetric Trauma	22; 23; 24	3	15	9	20	14	14	14,18	0.16	2,0	11	12	13	15	16	18
C8. Accompaniment	6; 7; 8	3	15	6	15	13	13	12,27	0.16	2,01	8	10	11	14	14	15
C9. Empathy	26; 15; 4	3	15	8	15	13	13	12,67	0.12	1,60	10	11	12	14	14,4	15
C10. Women's decisions	3; 13; 14	3	15	5	15	11	11	11,01	0.16	2,11	7	9	10	12	13	15
C11. Medicalization	20; 21; 28; 29; 46; 48	6	30	14	25	18	19	18.74	0.17	2,12	15	17	19	20	21	23
C12. Commitment	27; 51; 52	3	15	8	15	13	12	12,04	0.12	1,50	9,8	10	11	13	13	15
C13. Decision making	30; 47	2	10	4	10	6	6	6,42	0.09	1,23	4,8	5	6	7	8	9
C14. Clinical priorities	5; 16	2	10	2	10	6	5	5,07	0.12	1,52	3	3	5	6	6,4	7

Overall, women scored significantly higher in Component 6 [13,1 (SD 1.9) against 12.5 (SD 1.5), t-Student – 2.1; 154 df; p < 0.03 in male students], and Component 8 [12.6 (SD 1.7) against 11.4 (SD 2.2); t-Student – 3.2; 69 df; p < 0.002 in male students], but no other sociodemographic differences were found for the remaining components (Table 6).

Discussion

This article describes the development and validation processes of the Spanish version of CAVE-st, an instrument designed to measure health sciences students' attitudes towards women's childbirth experiences. CAVE-st resulted in a 52-item questionnaire that consists of 14 latent components which were related to four major dimensions, Beliefs regarding childbirth, Knowledge on childbirth related trauma, Recognition of childbirth related trauma, and Childbirth related performance. The psychometric analyses revealed that CAVE-st is a reliable and valid tool to use in health science academic contexts. This questionnaire offers an important means to identify which dimensions of psychosocial care need to be improved in the perinatal syllabus, to promote better care for women at childbirth.

A number of studies have been published in the last decade that explore incorporating specific competencies or pedagogical interventions in medical, nursing or midwifery study programs to improve the quality of woman-professional interactions during the perinatal period (18, 19, 28–30, 20–27). Most of these studies are surveys conducted among education experts and programme directors, with particular attention to training needs in relation to dignity, respect (27, 30) and perinatal mental health (20). Regarding undergraduate students, some authors have proposed interprofessional education initiatives, involving midwives and nurses as teachers to develop communication and support skills (18, 29). These studies involved training first-year medical students that provided clinical and non-clinical care to pregnant women, and the training covered issues such as paying attention to women instead of the electronic instruments in the delivery room, speaking in an appropriate tone, attending to women's needs, and providing emotional or physical support (20, 23). The

CAVE-st questionnaire that we have developed and validated could be a useful tool to identify specific dimensions to target during the training, and a method to assess students' learning. It could also be useful to reveal educational needs in offering women individualized attention (31), or the meta-cognitive skills needed for effective communication (32).

CAVE-st may also be useful to assess students' perception of risk in perinatal scenarios. Student's perception of risk or safety of the clinical situation can differ from the perspective of the woman, and also from other members of the care team. This is largely due to assessments being based on subjective, rather than objective and measurable indicators (33). How students complete the questionnaire could thereby help to highlight how they value the need for implicit communication in determining the risks or certainties perceived by others (34). Also, our tool has the advantage of including the theoretical and practical aspects of birth related trauma and perinatal mental health (20, 35–38).

During labour and birth, humanity and compassion are essential elements of a woman's care, and especially in cases with complications (39). Many factors can hinder professionals' providing person-centred care (40) such as the need to protect the safety of the mother and the foetus, irrespective of a woman's preferred birthing choices. Efforts should be aimed at fostering environments in which, in addition to pursuing the best possible obstetric and perinatal outcomes, women feel in control of the situation, safe and respected (41) For this purpose, CAVE-st may be an useful tool.

Limitations And Strengths

Some limitations need to be considered. First, as this is the first instrument to assess students' attitudes towards childbirth, we could not compare our results with any other published results. Second, the validation was based on the responses of a large homogenous sample of medical students, rather than wider health science students which may have weakened the reported psychometric properties. Posterior assessments in heterogeneous samples including nursing and midwifery students will improve validation results.

The strengths are that the development and validation of CAVE-st followed systematic and standard procedures, with a Delphi consensus and three different assessments undertaken. The collaboration with international and multidisciplinary academics in the design and execution of this study also strengthens our findings.

Conclusions

This study provides detailed insights into the development and psychometric properties of the Spanish version of the Cave-st questionnaire. Cave-st is the first questionnaire to assess health science students' attitudes of key factors that can impact on women's birth experiences. The results show that Cave-st is a valid and reliable tool and

further work is planned to translate, adapt and apply the instrument in other cultures and languages to capture international evidence. Cave-st can help identify what dimensions need to be integrated and reinforced in perinatal training programs, to compare variations in different pre-registration programmes and in different settings, and ultimately to help design optimum training programmes to improve women's experience of childbirth, and to avoid birth related trauma.

Declarations

Ethics approval and consent to participate

Ethical approval was obtained from *CEI de la Provincia de Malaga*. All the students participated voluntarily and gave their online written consent to participate.

Consent for publication

All authors agreed on the publication of this research

Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Competing interests

Authors do not have any competing interest to declare.

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Author contributions

Conceptualization: EGM, CRD, SIK, OR, GT, WA, OCG, GGI. Methodology: EGM, CR, OR, WA, DMN, SIK, SSJ, GT, JL, GGI; Formal analysis and investigation: CRD, OCG, EGM, WA, DMN, GGI, GT, OR, SSJ, SIK; Writing - original draft preparation: EGM, CRD, OR, OCG, JL, SIK, GT, DMN, WA; Writing - review and editing: GT, JL, WA, OR, SIK, ; Resources: CRD, EGM, OCG; Supervision: JL, OR, SIK, GT, WA, JL.

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Figures

Figure 1

Flow diagram for development and validation of CAVE st