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Preconception care incorporating anti-Müllerian hormone testing and counselling: a regional community-based study in Japan

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Abstract

Background

Preconception care offers an opportunity to improve women's health literacy and health behaviours before pregnancy, but scalable real-world models for women in the general population remain incompletely evaluated. Anti-Müllerian hormone (AMH) testing is increasingly familiar to reproductive-aged women, yet its limitations are frequently misunderstood. We evaluated whether a multifaceted preconception care intervention incorporating education, AMH testing and structured post-test counselling was associated with changes in preconception knowledge, AMH literacy and health-behaviour readiness among women aged 25–34 years.

Methods

This multicentre before-and-after implementation study evaluated a prefecture-wide programme conducted at eight medical institutions in Shiga Prefecture, Japan, between April 2025 and March 2026. Women aged 25–34 years viewed a preconception care educational video, underwent serum AMH testing and received structured counselling when results were disclosed. A study-specific longitudinal questionnaire was administered at baseline, immediately after AMH result disclosure and counselling (approximately 1 month after baseline), and at 3 months after baseline. Paired baseline-to-post-intervention analyses included 208 participants, and 93 completed the 3-month follow-up. Outcomes were a preconception knowledge score (4–12), an eight-item health-behaviour readiness score (8–40), an AMH literacy score (0–3) and concern about future fertility (1–4). Wilcoxon signed-rank and McNemar tests were used for paired comparisons.

Results

From baseline to immediately after the intervention, knowledge increased from 7.84 ± 1.95 to 10.56 ± 1.69, health-behaviour readiness from 23.92 ± 5.48 to 26.61 ± 4.93, and AMH literacy from 1.95 ± 0.83 to 2.39 ± 0.76 (all $P < 0.001$). Correct understanding that AMH does not indicate oocyte quality increased from 65.4% to 81.7%, and that AMH does not predict the likelihood of conception from 37.0% to 63.5% (both $P < 0.001$). Fertility concern increased modestly immediately after the intervention (2.28 ± 0.85 to 2.51 ± 0.83, $P < 0.001$) but was not significantly different between the immediate and 3-month assessments. At 3 months, knowledge remained high, health-behaviour readiness showed a small further increase that did not meet the prespecified $P < 0.01$ threshold, and AMH literacy remained stable.

Conclusions

A multifaceted preconception care programme incorporating AMH testing and structured counselling was associated with improved preconception knowledge, AMH literacy and health-behaviour readiness. Importantly, counselling corrected common misconceptions about AMH and may enable AMH testing to function as an educational entry point within broader women's health promotion rather than as a stand-alone fertility test.

Background

Preconception care encompasses biomedical, behavioural and social interventions delivered before pregnancy to improve women's health and future pregnancy outcomes while supporting informed reproductive life planning [1, 2]. Its relevance extends beyond women who are actively attempting conception because nutritional status, lifestyle, vaccination, chronic disease management and other modifiable factors may affect both current health and subsequent reproductive outcomes. Accordingly, preconception care is increasingly viewed as part of health promotion across the reproductive life course rather than solely as preparation for an imminent pregnancy [1–3].

However, implementation in the general population remains challenging. A recent systematic review published in BMC Women's Health identified heterogeneous preconception interventions delivered in healthcare, community and online settings and found that education, counselling and screening can improve knowledge and several health behaviours, while also highlighting the need for comprehensive and scalable approaches [3]. In Japan, workplace-based preconception check-ups with tailored counselling have also demonstrated feasibility and improvements in fertility knowledge and reproductive planning [4]. These findings support the development of practical models that can engage women who are not currently receiving fertility treatment.

Fertility-related biomarkers may provide one route to engagement, but their use creates an additional communication challenge. AMH is widely used as a marker of ovarian reserve and expected ovarian response; however, it reflects follicle quantity rather than oocyte quality and has limited value for predicting spontaneous conception in women with unproven fertility [6–10]. Professional societies therefore caution against presenting AMH as a stand-alone fertility test or as a predictor of time to natural pregnancy [7, 8]. If AMH testing is offered outside infertility care without appropriate explanation, deterministic interpretation of the result may produce false reassurance or unnecessary anxiety.

Against this background, we developed a prefecture-wide multifaceted preconception care programme combining an educational video, serum AMH testing and structured post-test counselling. The programme was designed not to use AMH as a predictor of individual fertility, but to use interest in reproductive health as an opportunity to improve broader health literacy and health-related behavioural readiness. The primary objective of this study was to evaluate changes in preconception knowledge, health-behaviour readiness and AMH literacy immediately after and 3 months after the intervention. Secondary and exploratory objectives were to evaluate concern about future fertility and changes in stated reproductive planning.

Methods

Study design and setting

This multicentre, observational before-and-after implementation study was conducted in Shiga Prefecture, Japan, between 1 April 2025 and 31 March 2026. The programme was implemented at eight medical institutions: Shiga University of Medical Science Hospital, Takako Ladies Clinic, Kusatsu Ladies Clinic, Hirata Ladies Clinic, Ukita Reproduction Clinic, Iris Women's Clinic, Matsushima Obstetrics and Gynecology Clinic, and Katsuragawa Ladies Clinic.

Participants

Women aged 25–34 years living in Shiga Prefecture were recruited for the prefecture-based programme, with a target enrolment of 300 participants. Women who completed both the baseline and immediate post-intervention questionnaires were included in the primary paired analysis. Those who additionally completed the questionnaire at 3 months were included in the follow-up analysis. Figure 1 shows participant flow.

Intervention

The intervention consisted of three components. First, participants viewed an educational video covering the concept of preconception care, healthy lifestyle practices, dietary guidance, folic acid and reproductive health. Second, serum AMH was measured using the Access assay (Beckman Coulter, USA) or the Lumipulse platform (Fujirebio, Japan), according to institutional practice. Third, participants received structured counselling when AMH results were disclosed. Counselling explicitly distinguished ovarian reserve from oocyte quality and explained that AMH cannot predict an individual woman's likelihood of natural conception.

Questionnaires and outcomes

The questionnaires used in this study were developed specifically for the prefecture-based preconception care programme and have not been previously published or formally validated. At enrolment, participants completed a registration questionnaire collecting sociodemographic and reproductive characteristics, including age, marital or partnership status, reproductive history, pregnancy intention, hormonal contraceptive use, and history of infertility treatment.

A separate longitudinal questionnaire was used to assess study outcomes. The same questionnaire was administered at baseline, immediately after AMH result disclosure and counselling (approximately 1 month after baseline), and at the 3-month follow-up. It assessed preconception care knowledge, health-

behaviour readiness, AMH literacy, and concern about future fertility. English-language versions of the registration and longitudinal questionnaires are provided in Supplementary file 1.

The preconception knowledge score comprised four items assessing awareness of dietary guidance for women before pregnancy, awareness of preconception care, awareness of folic acid and understanding of the reason for folic acid intake. Each item was scored from 1 to 3, yielding a total score of 4–12.

The health-behaviour readiness score comprised eight items: maintenance of appropriate body weight, balanced diet, alcohol restriction, vaccination, human papillomavirus vaccination, cancer screening, reproductive life planning and folic acid intake. Smoking was excluded from the composite because very few participants smoked. Each item was scored on a five-point scale, yielding a total score of 8–40. Because this composite includes stages of behavioural readiness as well as self-reported implementation, it is referred to as a health-behaviour readiness score rather than an objective measure of behaviour.

AMH literacy was assessed using three items from the AMH knowledge section of the longitudinal questionnaire: whether AMH reflects ovarian follicle quantity, whether AMH indicates oocyte quality, and whether AMH predicts the likelihood of natural conception. One point was assigned for each correct response, yielding a total score ranging from 0 to 3. The longitudinal questionnaire contained two additional AMH knowledge items that were not included in this composite score.

Concern about future fertility was measured on a four-point scale from 1 (not worried at all) to 4 (very worried). Exploratory analyses assessed changes in the stated timing of pregnancy intention.

Statistical analysis

The Wilcoxon signed-rank test was used to compare continuous and ordinal paired outcomes, and McNemar's test was used to assess changes in paired proportions for individual AMH literacy items. A two-sided P value < 0.01 was considered statistically significant to reduce over-interpretation across multiple outcomes. Continuous variables are presented as mean ± standard deviation for consistency with the programme's prespecified scoring framework, and categorical variables are reported as n (%).

Because not all participants completed the follow-up assessment, a post hoc attrition analysis compared baseline characteristics between participants who completed the 3-month assessment and those who did not. Continuous or ordinal variables were assessed using the Mann–Whitney U test, whereas categorical variables were evaluated using the chi-square test or Fisher's exact test, as appropriate. Standardised mean differences were also calculated as descriptive measures of between-group imbalance. No imputation of follow-up outcomes was performed.

Ethical approval and consent to participate

The study was conducted in accordance with the Declaration of Helsinki and was approved by the Institutional Review Board of Shiga University of Medical Science (approval No. R2026-024). Informed

consent was obtained in accordance with the requirements of the ethics committee and institutional policy.

Results

Participant flow and baseline characteristics

In total, 314 women completed the initial web survey. Of these, 208 completed paired baseline and immediate post-intervention assessments at a participating institution, and 93 completed the 3-month follow-up (Fig. 1). In the paired cohort, the mean age was 28.7 ± 2.6 years, and 161 of 208 participants (77.4%) were aged 25–30 years. Baseline characteristics are summarised in Table 1. At the prespecified significance threshold ($P < 0.01$), no baseline variable differed significantly between 3-month completers and non-completers (Supplementary file 2: Table S1).

Table 1
Baseline characteristics of the paired pre/post cohort

Characteristic	Value
Participants	208
Age, years, mean ± SD	28.7 ± 2.6
Age 25–30 years, n (%)	161 (77.4)
Married/cohabiting with partner, n (%)	127 (61.1)
Prior infertility treatment, n (%)	4 (1.9)
Pregnancy intended within 6 months, n (%)	71 (34.1)
Pregnancy intended within 2 years, n (%)	150 (72.1)
Baseline knowledge score (4–12), mean ± SD	7.84 ± 1.95
Baseline health-behaviour readiness score, mean ± SD	23.92 ± 5.48
Baseline AMH literacy score (0–3), mean ± SD	1.95 ± 0.83
Baseline fertility concern (1–4), mean ± SD	2.28 ± 0.85
The health-behaviour composite excluded smoking because very few participants smoked. Reproductive-intention categories were derived from the baseline questionnaire.	

Immediate changes after the intervention

Preconception knowledge, health-behaviour readiness and AMH literacy increased from baseline to immediately after the intervention (all $P < 0.001$). Concern about future fertility also increased modestly ($P < 0.001$) (Table 2).

Table 2
Changes in principal outcome scores

Outcome	Comparison	n	Earlier	Later	P value
Knowledge score (4–12)	Baseline → immediate	208	7.84 ± 1.95	10.56 ± 1.69	**< 0.001**
Health-behaviour readiness score	Baseline → immediate	208	23.92 ± 5.48	26.61 ± 4.93	**< 0.001**
AMH literacy score (0–3)	Baseline → immediate	208	1.95 ± 0.83	2.39 ± 0.76	**< 0.001**
Fertility concern (1–4)	Baseline → immediate	208	2.28 ± 0.85	2.51 ± 0.83	**< 0.001**
Knowledge score (4–12)	Immediate → 3 months	93	10.92 ± 1.42	11.28 ± 1.03	**0.008**
Health-behaviour readiness score	Immediate → 3 months	93	26.88 ± 4.93	27.82 ± 5.26	0.046
AMH literacy score (0–3)	Immediate → 3 months	93	2.47 ± 0.73	2.52 ± 0.73	0.536
Fertility concern (1–4)	Immediate → 3 months	93	2.55 ± 0.85	2.48 ± 0.96	0.416

Values are mean ± SD. P values are from two-sided Wilcoxon signed-rank tests. A two-sided P < 0.01 was considered statistically significant. AMH, anti-Müllerian hormone.

Changes in AMH literacy

At baseline, 92.3% of participants correctly identified AMH as reflecting ovarian follicle quantity; this proportion was 93.8% immediately after the intervention (P = 0.678). By contrast, correct understanding that AMH does not indicate oocyte quality increased from 65.4% to 81.7%, and correct understanding that AMH does not predict the likelihood of conception increased from 37.0% to 63.5% (both P < 0.001) (Table 3; Fig. 2).

Table 3
Correct responses to individual AMH literacy items before and immediately after the intervention

Statement	Baseline correct	Immediate correct	P value
AMH reflects ovarian follicle quantity	92.3%	93.8%	0.678
AMH does not indicate oocyte quality	65.4%	81.7%	**< 0.001**
AMH does not predict likelihood of conception	37.0%	63.5%	**< 0.001**

P values are from McNemar tests. A two-sided P < 0.01 was considered statistically significant. AMH, anti-Müllerian hormone.

Three-month follow-up

Among the 93 participants who completed the 3-month follow-up, the knowledge score remained high and increased slightly from 10.92 ± 1.42 immediately post-intervention to 11.28 ± 1.03 at 3 months (P = 0.008). The health-behaviour readiness score showed a small further increase from 26.88 ± 4.93 to 27.82 ± 5.26, but this did not meet the prespecified significance threshold (P = 0.046). AMH literacy remained stable at a high level (2.47 ± 0.73 to 2.52 ± 0.73, P = 0.536), and concern about future fertility was not significantly different (2.55 ± 0.85 to 2.48 ± 0.96, P = 0.416) (Table 2). These findings are consistent with maintenance of the immediate educational effect rather than further improvement in AMH literacy.

Exploratory reproductive planning outcomes

Among 204 participants with paired baseline and immediate post-intervention reproductive-intention responses, the distribution of stated pregnancy timing shifted from an unspecified future intention towards more specific timing. At 3 months, among 90 paired respondents, the proportion reporting an intention to become pregnant within 6 months increased. Direction-of-change analyses did not meet the prespecified P < 0.01 threshold and are therefore considered exploratory (Supplementary file 2: Table S2).

Discussion

This multicentre real-world implementation study showed that a preconception care programme combining education, AMH testing and structured post-test counselling was associated with substantial immediate gains in preconception knowledge and AMH literacy, together with greater readiness for several health-related behaviours. These findings are particularly relevant to women's health promotion because the intervention was delivered to reproductive-aged women in a community-facing programme rather than to patients already receiving infertility treatment. Most educational gains were maintained at 3 months, supporting the short-term durability of the intervention.

The central finding was not that AMH functions as a fertility test; rather, the programme improved participants' understanding of what AMH can and cannot indicate. Ovarian reserve is often conflated with fertility, although AMH is useful primarily for estimating ovarian reserve and ovarian response and is a poor independent predictor of natural conception [6–10]. Consistent with professional guidance, our counselling explicitly stated that AMH does not measure oocyte quality and cannot determine an individual woman's probability of natural conception [7, 8]. The largest literacy gain was observed for the latter misconception. This suggests that if AMH is incorporated into preconception care, the explanatory framework around the test is at least as important as the laboratory result itself.

The broader improvements in knowledge and health-behaviour readiness are consistent with the growing literature on preconception health promotion. Skogsdal et al. reported that reproductive life-plan counselling improved fertility knowledge and preconception health awareness [5], while a Japanese

workplace-based programme demonstrated the feasibility of preconception check-ups combined with tailored counselling [4]. A recent systematic review in BMC Women's Health found that educational, counselling and screening interventions can improve preconception knowledge and several behavioural outcomes but also highlighted heterogeneity in intervention content and the need for comprehensive approaches [3]. Our study extends this evidence by evaluating a multicentre public programme and by incorporating AMH-specific literacy as an explicit safety and educational outcome.

The modest immediate increase in concern about future fertility warrants careful interpretation. The change was small and was not maintained at 3 months. Personalised reproductive information may transiently increase the salience of future fertility without necessarily producing persistent distress. Nevertheless, psychological effects should be treated as a safety outcome when fertility-related biomarkers are offered to asymptomatic women. Future studies should therefore include validated measures of anxiety, decisional conflict and reassurance and examine whether psychological responses differ by AMH level, baseline reproductive intention or health literacy.

The exploratory reproductive-planning findings should not be interpreted as evidence that the programme promotes earlier pregnancy. Reproductive decisions are influenced by partnership, employment, finances and personal values. The appropriate role of preconception care is to support informed choice rather than to direct a particular reproductive decision. In our data, changes in stated pregnancy timing did not meet the prespecified statistical threshold, and these findings are best regarded as hypothesis-generating.

This study has several strengths. It was implemented across eight institutions as part of a public regional programme, increasing practical relevance and demonstrating feasibility beyond a single specialist centre. It assessed linked domains of women's health promotion, including general preconception knowledge, behavioural readiness, AMH-specific literacy, fertility concern and reproductive planning. In addition, a 3-month follow-up allowed assessment of whether the immediate educational effect persisted.

Several limitations should be acknowledged. First, the uncontrolled before-and-after design cannot establish causality; temporal effects, testing effects and self-selection may have contributed to the observed changes. Second, the intervention combined video education, AMH testing and counselling, so the independent contribution of each component cannot be determined. Third, outcomes were self-reported, and the behavioural composite reflects readiness or reported behaviour rather than objectively verified health behaviour. Fourth, fewer than half of the immediate post-intervention participants completed the 3-month follow-up; although no baseline characteristic differed significantly at the prespecified threshold, attrition bias cannot be excluded. Fifth, volunteers in a public programme may have had greater interest in health or fertility than the general population. Sixth, two AMH assay platforms were used across institutions, and factors such as hormonal contraception may affect AMH values. Because this study evaluated education and health promotion rather than clinical prediction, no inference regarding individual fertility should be drawn from AMH values.

Future research should use controlled designs to separate the effects of education, biomarker testing and counselling, evaluate longer-term health behaviours and psychological outcomes, and identify subgroups that may require more intensive counselling. The emphasis should remain on informed reproductive decision-making and broader women's health promotion rather than on AMH testing as a stand-alone screening strategy.

Conclusions

A multicentre preconception care programme incorporating AMH testing and structured counselling was associated with improved preconception knowledge, AMH literacy and health-behaviour readiness among women aged 25–34 years. Counselling substantially corrected misconceptions that AMH reflects oocyte quality or predicts natural conception. These findings support the use of AMH, when accompanied by explicit explanation of its limitations, as a potential educational entry point within broader women's health promotion and preconception care rather than as a stand-alone fertility test.

Abbreviations

AMH, anti-Müllerian hormone; HPV, human papillomavirus; SMD, standardised mean difference.

Declarations

Ethics approval and consent to participate

The study was conducted in accordance with the Declaration of Helsinki and was approved by the Institutional Review Board of Shiga University of Medical Science (approval No. R2026-024). Informed consent was obtained in accordance with the requirements of the ethics committee and institutional policy.

Consent for publication

Not applicable.

Availability of data and materials

The de-identified datasets analysed during the current study are available from the corresponding author on reasonable request, subject to ethics approval and applicable institutional and governmental data-governance requirements.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

A.T. conceived and designed the study, contributed to study implementation and data interpretation, and drafted the manuscript. T.H. contributed to study implementation and reviewed and revised the manuscript. S.T. contributed to study supervision, programme implementation, data interpretation, and critical revision of the manuscript. All authors read and approved the final manuscript and agree to be accountable for all aspects of the work.

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Figures

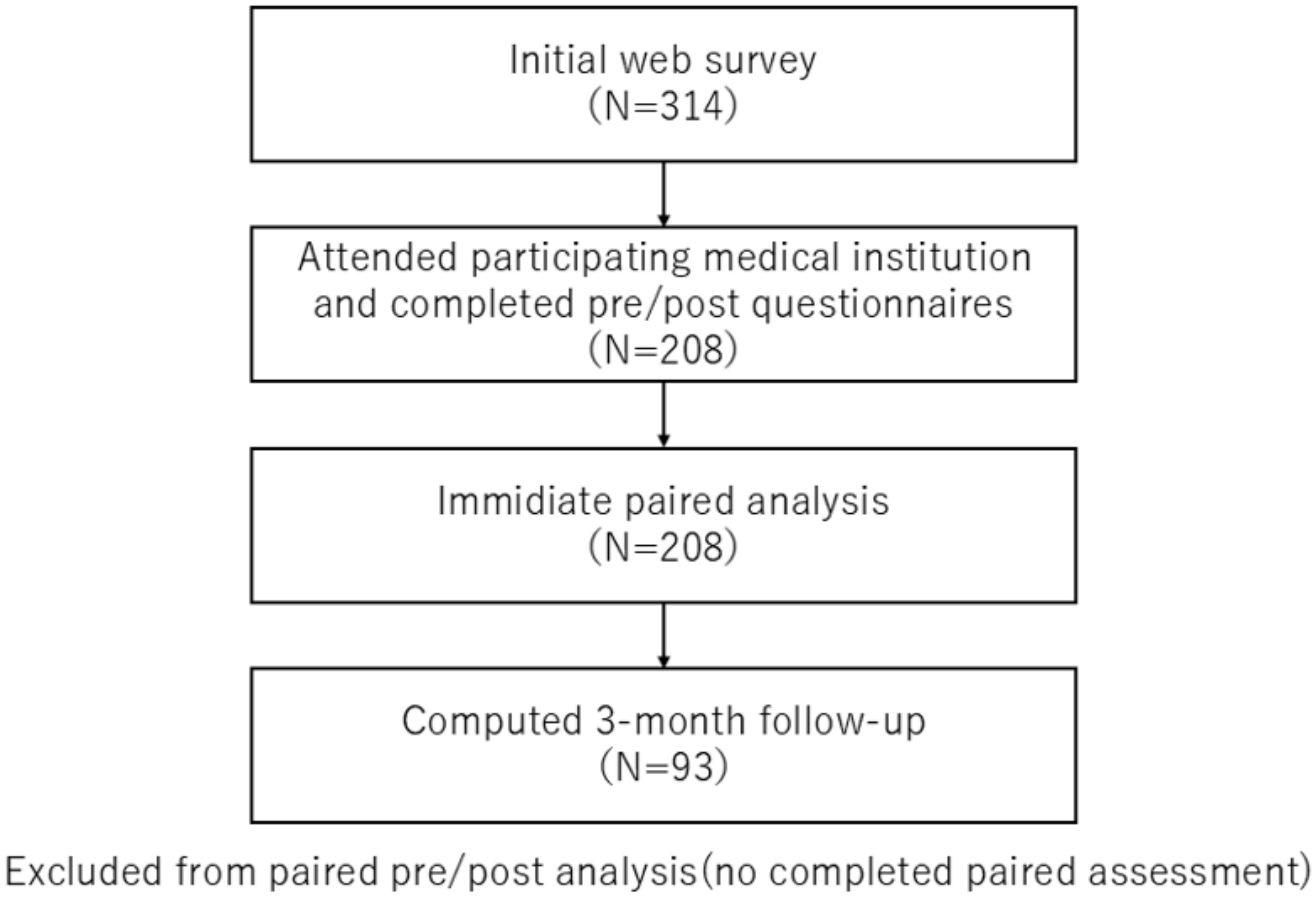


Figure 1

Participant flow through the preconception care programme and analytic cohorts.

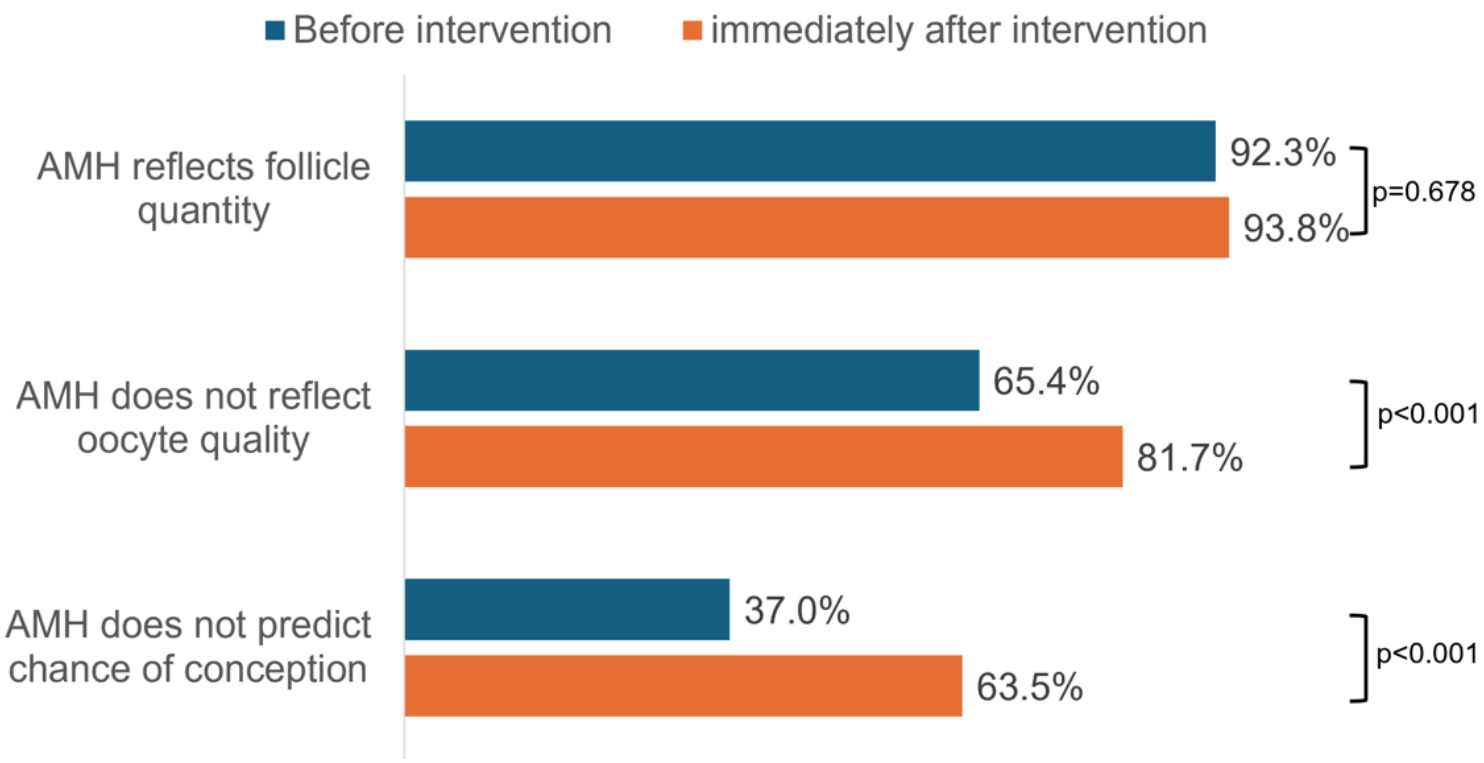


Figure 2

Correct responses to the three anti-Müllerian hormone (AMH) literacy statements before and immediately after the intervention. The items assessed the following: recognition that AMH reflects ovarian follicle quantity; recognition that AMH does not indicate oocyte quality; and recognition that AMH does not predict the likelihood of natural conception.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- SupplFile1EnglishQuestionnairesBMCWomensHealth.docx
- SupplFile2TableBMCWomensHealth.docx