



Is there a relationship between anti-Mullerian hormone (AMH) levels and the prediction of ovarian reserve in reproductive-age women undergoing fertility evaluation? : A Systematic Review

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Article History :

Received date : 2026/01/22

Revised date : 2026/02/06

Accepted date : 2026/03/17

Published date : 2026/04/11



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E-ISSN :

ISSN 3048-1368



P-ISSN

ISSN 3048-1376



ABSTRACT

Introduction: Accurate assessment of ovarian reserve is crucial for counseling women undergoing fertility evaluation. Anti-Müllerian hormone (AMH) has emerged as a promising biomarker, yet its predictive value for ovarian reserve in reproductive-age women requires systematic evaluation. This systematic review aims to determine the relationship between AMH levels and ovarian reserve prediction in reproductive-age women undergoing fertility assessment.

Methods: A systematic review of 80 studies involving reproductive-age women (18-45 years) undergoing fertility evaluation was conducted. Studies were included if they measured serum AMH levels, assessed ovarian reserve through validated markers (antral follicle count [AFC], ovarian volume, response to

stimulation), and examined their correlation. Data extraction encompassed AMH measurement protocols, ovarian reserve assessment methods, statistical relationships, and confounding factors.

Results: AMH demonstrated consistently strong correlations with AFC across studies ($r=0.48-0.89$), with the strongest correlations observed with histological primordial follicle count ($p=0.75$). For predicting poor ovarian response, AMH showed excellent discriminatory ability (AUC 0.75-0.93), with cutoff values ranging from 0.7-1.37 ng/mL across different assays. AMH outperformed traditional markers including basal FSH and demonstrated superior reproducibility (ICC=0.89) compared to AFC (ICC=0.73). Age-stratified analyses revealed that in women >35 years, AMH (AUC=0.858) significantly outperformed AFC (AUC=0.675) in predicting suboptimal response. For high response prediction, AMH achieved AUC values of 0.81-0.91. However, AMH's predictive ability for pregnancy outcomes was more modest (AUC 0.56-0.63), operating primarily through oocyte quantity rather than quality. Discordance between AMH and AFC occurred in approximately 20% of women, increasing with age.

Discussion: AMH consistently demonstrates strong correlation with ovarian reserve markers, particularly AFC, and shows excellent predictive accuracy for extremes of ovarian response in assisted reproduction. Its superior reproducibility and age-dependent performance—especially superior to AFC in women over 35 years—support its role as a primary ovarian reserve marker. However, significant heterogeneity exists due to assay platforms, population characteristics, and outcome definitions. The

biological variability and assay-specific differences necessitate platform-specific reference ranges.

Conclusion: AMH is a reliable predictor of ovarian reserve in reproductive-age women undergoing fertility evaluation, with strongest performance for quantitative outcomes and extremes of response. Clinical implementation requires standardized assays, age-specific interpretation, and recognition that AMH predicts oocyte quantity rather than quality. Future research should focus on assay standardization, population-specific thresholds, and integration with other clinical parameters.

Keywords: Anti-Müllerian hormone; ovarian reserve; antral follicle count; fertility assessment; ovarian response; reproductive-age women

INTRODUCTION

Accurate assessment of ovarian reserve is fundamental to fertility evaluation and counseling, enabling clinicians to predict response to ovarian stimulation, optimize treatment protocols, and provide realistic prognostic information to patients (1,2). Ovarian reserve reflects the quantity and quality of remaining ovarian follicles, which progressively declines with age and varies considerably among women of similar chronological age (3,4). Traditional markers including basal follicle-stimulating hormone (FSH), inhibin B, and estradiol have demonstrated limited predictive accuracy, particularly due to their cyclical variability and poor reproducibility (5,6).

Anti-Müllerian hormone (AMH), a dimeric glycoprotein produced exclusively by granulosa cells of preantral and small antral follicles, has emerged as a promising biomarker of ovarian reserve over the past two decades (7,8). Unlike FSH, AMH exhibits minimal cycle-to-cycle variability, can be measured at any menstrual cycle phase, and directly reflects the size of the growing follicular pool (9,10). These characteristics position AMH as potentially the ideal ovarian reserve marker, yet questions remain regarding its predictive accuracy across diverse populations, its comparative performance relative to antral follicle count (AFC), and the influence of assay platforms and patient characteristics on its clinical utility (11,12).

Research Gap: Despite extensive investigation, significant heterogeneity exists in reported correlations between AMH and ovarian reserve markers, with correlation coefficients ranging from 0.30 to 0.89 across studies (1,3,13). This variability may stem from differences in assay methodology, population characteristics, timing of measurement, and outcome definitions. Furthermore, the relative performance of AMH compared to AFC—particularly across different age strata—remains incompletely characterized, with conflicting evidence regarding which marker should serve as the primary clinical tool (14,15). Importantly, the relationship between AMH and clinically meaningful outcomes such as live birth, as opposed to intermediate outcomes like oocyte yield, requires systematic evaluation (16,17).

Novelty: This systematic review provides a comprehensive synthesis of evidence examining the relationship between AMH and ovarian reserve prediction specifically in reproductive-age women undergoing fertility evaluation. Unlike previous reviews that have focused narrowly on assisted reproduction outcomes, this analysis encompasses both natural fertility and treatment contexts, incorporates age-stratified analyses, examines assay-specific performance characteristics, and addresses the clinically significant phenomenon of AMH-AFC discordance.

Research Question: Is there a relationship between anti-Mullerian hormone (AMH) levels and the prediction of ovarian reserve in reproductive-age women undergoing fertility evaluation?

Objectives: This systematic review aims to: (1) quantify the correlation between AMH and established ovarian reserve markers, particularly AFC; (2) evaluate the predictive accuracy of AMH for ovarian response categories; (3) compare AMH performance with other ovarian reserve markers across age groups; (4) assess the relationship between AMH and pregnancy outcomes; and (5) identify sources of heterogeneity in AMH predictive performance.

Hypothesis: AMH levels demonstrate significant positive correlation with quantitative ovarian reserve markers and predict ovarian response to stimulation with high accuracy, though predictive ability for pregnancy outcomes is more modest and mediated through oocyte quantity.

Benefits: This synthesis will inform clinical practice by clarifying the optimal use of AMH in fertility evaluation, identifying patient subgroups in which AMH performs best, and highlighting methodological considerations necessary for accurate interpretation of AMH values.

METHODS

Protocol

The study strictly adhered to the Preferred Reporting Items for Systematic Review and Meta-Analysis (PRISMA) 2020 guidelines to ensure methodological rigor and accuracy. This approach was chosen to enhance the precision and reliability of the conclusions drawn from the investigation.

Criteria for Eligibility

This systematic review aims to evaluate Is there a relationship between anti-Mullerian

hormone (AMH) levels and the prediction of ovarian reserve in reproductive-age women undergoing fertility evaluation?

Screening

We screened in sources based on their abstracts that met these criteria:

- **Population Age and Context:** Does the study include women of reproductive age (18-45 years) undergoing fertility evaluation or assessment?
- **AMH Measurement:** Does the study measure serum Anti-Müllerian Hormone (AMH) levels?
- **Ovarian Reserve Assessment:** Does the study assess ovarian reserve through validated markers (such as antral follicle count, ovarian volume, response to ovarian stimulation, or other established ovarian reserve markers)?
- **Study Design:** Is the study an observational study (cross-sectional, cohort, or case-control), systematic review, or meta-analysis?
- **Population Without Confounding Conditions:** Does the study avoid focusing exclusively on women with specific medical conditions that significantly affect ovarian function (such as PCOS, premature ovarian insufficiency, cancer patients, or post-menopausal women)?
- **AMH Methodology Quality:** Does the study provide clear AMH measurement methodology using standard or validated AMH assays?
- **Study Relevance to Research Question:** Does the study examine the correlation or relationship between AMH and ovarian reserve markers (rather than focusing solely on AMH reference ranges)?
- **Study Type Quality:** Is the study a full research article (not a case report, editorial, conference abstract, or opinion piece)?

We considered all screening questions together and made a holistic judgement about whether to screen in each paper.

Search Strategy

The keywords used for this research based PICO :

Element	P (Population)	I (Intervention/Exposure)	C (Comparison/Context)	O (Outcome)
Keyword 1	Women of reproductive age	Anti-Mullerian Hormone	Antral follicle count	Ovarian reserve prediction
Keyword 2	Childbearing-age women	AMH level	Ovarian reserve markers	Ovarian response
Keyword 3	IVF patients	Serum AMH	Follicle-stimulating hormone	Oocyte yield
Keyword 4	Women undergoing fertility assessment	AMH measurement	Ovarian reserve tests	Correlation with AFC

The Boolean MeSH keywords inputted on databases for this research are: (*"Women of reproductive age" OR "Childbearing-age women" OR "IVF patients" OR "Women undergoing fertility assessment"*) AND (*"Anti-Mullerian Hormone" OR "AMH level" OR "Serum AMH" OR "AMH measurement"*) AND (*"Antral follicle count" OR "Ovarian reserve markers" OR "Follicle-stimulating hormone" OR "Ovarian reserve tests"*) AND (*"Ovarian reserve prediction" OR "Ovarian response" OR "Oocyte yield" OR "Correlation with AFC"*)

Data extraction

- **AMH Measurement:**

Extract comprehensive details about AMH measurement in women undergoing fertility evaluation, including:

- AMH levels reported (mean, median, range with units)
- Timing of AMH measurement (cycle day, relationship to treatment)
- Laboratory method/assay used for AMH measurement
- Reference ranges or cutoff values used
- Any standardization or quality control measures mentioned

- **Ovarian Reserve Assessment:**

Extract all methods used to assess ovarian reserve in the fertility evaluation context, including:

- Primary ovarian reserve markers used (AFC, ovarian volume, response to stimulation, FSH, inhibin B, etc.)
- Measurement protocols and timing
- Cutoff values or criteria for defining poor/normal/high ovarian reserve
- Equipment or techniques used (ultrasound specifications, stimulation protocols)
- How ovarian reserve outcomes were categorized or quantified

- **AMH-Ovarian Reserve Relationship:**

Extract the statistical relationship between AMH levels and ovarian reserve prediction, including:

- Correlation coefficients (r , r_s) between AMH and ovarian reserve measures

- Predictive accuracy measures (AUC, sensitivity, specificity, odds ratios)
- Direction and strength of association (positive/negative, weak/moderate/strong)
- Statistical significance levels (p-values, confidence intervals)
- Comparative performance of AMH vs. other ovarian reserve predictors

- **Study Population:**

Extract characteristics of women of reproductive age undergoing fertility evaluation, including:

- Sample size and age distribution (mean age, age ranges, age groups)
- Fertility status and indications for evaluation (infertility duration, primary/secondary infertility)
- Inclusion/exclusion criteria specific to reproductive age and fertility context
- Relevant clinical characteristics (PCOS, previous treatments, cycle regularity)
- Any population subgroups analyzed separately

- **Study Methodology:**

Extract study design and methodological details for investigating AMH-ovarian reserve relationships, including:

- Study design (prospective, retrospective, cross-sectional)
- Duration of follow-up and timing of assessments
- Statistical analysis methods used to assess AMH-ovarian reserve relationships
- Sample size calculations or power analysis

- Primary and secondary endpoints related to the AMH-ovarian reserve question

- **Confounding Factors:**

Extract information about potential confounding variables and adjustments made in analyzing AMH-ovarian reserve relationships, including:

- Age adjustments or stratification
- Other hormonal or clinical factors controlled for
- Multivariate analysis variables included
- Subgroup analyses by age, BMI, or clinical characteristics
- Limitations acknowledged regarding confounding or bias

Table 1. Article Search Strategy

Database	Keywords	Hits
Pubmed	<i>("Women of reproductive age" OR "Childbearing-age women" OR "IVF patients" OR "Women undergoing fertility assessment") AND ("Anti-Mullerian Hormone" OR "AMH level" OR "Serum AMH" OR "AMH measurement") AND ("Antral follicle count" OR "Ovarian reserve markers" OR "Follicle-stimulating hormone" OR "Ovarian reserve tests") AND ("Ovarian reserve prediction" OR "Ovarian response" OR "Oocyte yield" OR "Correlation with AFC")</i>	98
Semantic Scholar	<i>("Women of reproductive age" OR "Childbearing-age women" OR "IVF patients" OR "Women undergoing fertility assessment") AND ("Anti-Mullerian Hormone" OR "AMH level" OR "Serum AMH" OR "AMH measurement") AND ("Antral follicle count" OR "Ovarian reserve markers" OR "Follicle-stimulating hormone" OR "Ovarian reserve tests") AND ("Ovarian reserve prediction" OR "Ovarian response" OR "Oocyte yield" OR "Correlation with AFC")</i>	21
Springer	<i>("Women of reproductive age" OR "Childbearing-age women" OR "IVF patients" OR "Women undergoing fertility assessment") AND ("Anti-Mullerian Hormone" OR "AMH level" OR "Serum AMH" OR "AMH measurement") AND ("Antral follicle count" OR "Ovarian reserve markers" OR "Follicle-stimulating hormone" OR "Ovarian reserve tests") AND ("Ovarian reserve prediction" OR "Ovarian response" OR "Oocyte yield" OR "Correlation with AFC")</i>	249
Google Scholar	<i>("Women of reproductive age" OR "Childbearing-age women" OR "IVF patients" OR "Women undergoing fertility assessment") AND ("Anti-Mullerian Hormone" OR "AMH level" OR "Serum AMH" OR "AMH measurement") AND ("Antral follicle count" OR "Ovarian reserve markers" OR "Follicle-stimulating hormone" OR "Ovarian reserve tests") AND ("Ovarian reserve prediction" OR "Ovarian response" OR "Oocyte yield" OR "Correlation with AFC")</i>	9,110
Wiley Online Library	<i>("Women of reproductive age" OR "Childbearing-age women" OR "IVF patients" OR "Women undergoing fertility assessment") AND ("Anti-Mullerian Hormone" OR "AMH level" OR "Serum AMH" OR "AMH measurement") AND ("Antral follicle count" OR "Ovarian reserve markers" OR "Follicle-stimulating hormone" OR "Ovarian reserve tests") AND ("Ovarian reserve prediction" OR "Ovarian response" OR "Oocyte yield" OR "Correlation with AFC")</i>	113

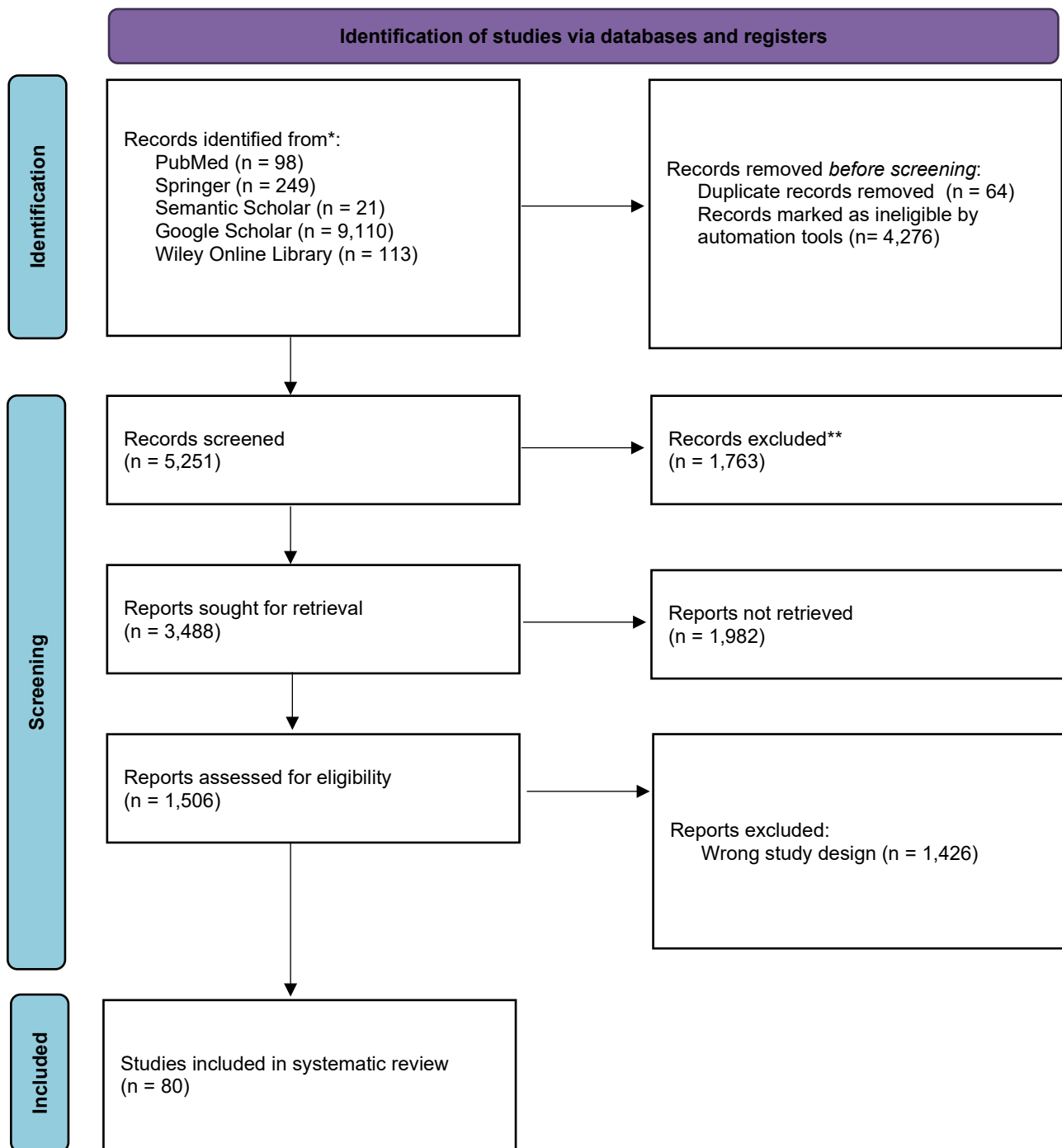


Figure 1. Article search flowchart

RESULTS

Characteristics of Included Studies

A total of 80 studies were analyzed to assess the relationship between anti-Müllerian hormone (AMH) levels and ovarian reserve prediction in women of reproductive age undergoing fertility evaluation. The studies were conducted across diverse geographical locations and employed various methodological approaches.

Study	Sample Size	Age Range (years)	Primary Focus
K. Freeman et al., 2023 [9]	577	22-45	Clinical performance evaluation of ADVIA Centaur AMH assay
J. Kwee et al., 2008 [21]	110	Not specified	Comparison of AMH with established ovarian reserve tests
K. Majumder et al., 2010 [22]	162	<40	Prediction of oocyte and embryo quality
I.A.J. van Rooij et al., 2002 [23]	130	Not specified	AMH as marker of ovarian reserve
M. Dayal et al., 2014 [24]	130	18-43	AMH as marker of ovarian function
L. Barbakadze et al., 2015 [25]	112	<35 to 41-46	Correlations of AMH, FSH, and AFC across age groups

Study	Sample Size	Age Range (years)	Primary Focus
L. Nardo et al., 2007 [3]	136	Not specified	Relationship between AMH and lifestyle factors
L. Nardo et al., 2009 [5]	165	<40	Prediction of ovarian response to stimulation
K. Jayaprakasan et al., 2010 [26]	135	Not specified	Comparison of AMH with 3D ultrasound parameters
J. Bentzen et al., 2013 [27]	366	21-41	Age-related decline of ovarian follicle subclasses
R. Fanchin et al., 2005 [14]	47	Not specified	Reproducibility of AMH measurements
A. Steiner et al., 2011 [28]	100	30-44	AMH as predictor of natural fecundability
Behiye Pınar Çilesiz Göksedef et al., 2010 [1]	141	Mean 29.18	Correlation of AFC and AMH
S. Sinha et al., 2022 [4]	100	18-43	AMH as marker of ovarian reserve and function
B. Almog et al., 2011 [29]	3,871	24-≥39	Age-related normograms for AMH

Study	Sample Size	Age Range (years)	Primary Focus
C. Gnoth et al., 2015 [30]	40	18-37	AMH levels throughout menstrual cycle
E. Tsakos et al., 2014 [31]	105	Not specified	Predictive value of AMH, FSH, and AFC
V. Genro et al., 2011 [32]	162	Not specified	AMH and antral follicle responsiveness to FSH
J. R. Lee et al., 2010 [33]	74	Not specified	AMH dynamics during controlled ovarian hyperstimulation
N. Santoro et al., 2017 [34]	750	30-44	Using AMH to predict fertility
P. Maidana et al., 2020 [35]	49	25-45	Age influence on AMH and AFC evaluation
J. B. Scheffer et al., 2007 [36]	101	Not specified	Relationship of AMH with ovarian follicular status
R. Anderson et al., 2015 [37]	451	18-44	Evaluation of automated Elecsys AMH assay
Yu-xia He et al., 2013 [6]	331	Not specified	Estimation of ovarian response using multiple predictors

Study	Sample Size	Age Range (years)	Primary Focus
R. Rabinowitz et al., 2005 [38]	56	<38	Dynamic assays of ovarian reserve markers
N. Polyzos et al., 2013 [7]	Not specified	Not specified	Predictors of ovarian response with corifollitropin alfa
Jhosselin Yaneth López Sagastume et al., 2025 [16]	95	18-35	Relationship between AMH and AFC
B. Leader et al., 2012 [39]	5,354	20-45	Discordance between AMH and FSH levels
V. Baker et al., 2018 [8]	178	21-45	Access AMH assay for predicting poor ovarian response
E. Bosch et al., 2022 [40]	1,248	18-48	Prediction of ovarian response using Elecsys AMH
L. Bungum et al., 2018 [41]	26	22-50	Biological variability of AMH across menstrual cycles
E. Anckaert et al., 2019 [42]	149	<44	Evaluation of Elecsys AMH for predicting hyper-response

Study	Sample Size	Age Range (years)	Primary Focus
M. Ashrafi et al., 2017 [43]	550	Not specified	Predictive values of AMH, AFC, and ORPI
Bhuwan Prasad Ojha et al., 2022 [44]	78	Mean 27.6	Relation of AFC and FSH with AMH
R. Lee et al., 2020 [17]	263	Mean 35.0	Ovarian biomarkers predicting COH outcomes in Singapore
M. Laqqan et al., 2022 [45]	462	Mean 29.3	AMH and AFC predicting ovarian response
Mustafa Bertan Demir et al., 2025 [46]	89	35-48	Correlation between AMH, AFC, and primordial follicles
E. C. Tan et al., 2019 [47]	43	21-45	Comparison of automated AMH assays and AFC
Nsahlai Cjf et al., 2026 [48]	282	20-43	Predictive value of AMH and AFC in African women
A. Grynnerup et al., 2019 [49]	107	18-40	Lower AMH threshold for ovarian stimulation
Neena Malhotra et al., 2024 [50]	Not specified	Not specified	Age-specific variations in ovarian reserves

Study	Sample Size	Age Range (years)	Primary Focus
A. Marino et al., 2023 [15]	161	21-40	Comparison of automated AMH versus AFC
Selina Tsz Ching Lee et al., 2025 [10]	779	Not specified	Predictive performance of AMH and AFC in progestin protocol
L. Melado et al., 2025 [51]	72	Median 39	High-specific AMH assays in poor responders
L. Melado Vidales et al., 2024 [52]	2,163	Mean 35.6	AMH/AFC ratio predicting ovarian responsiveness
L. Marqueta et al., 2022 [53]	2,564	18-50	Ovarian reserve markers predicting euploid blastocysts
Dorota Szczęsna et al., 2024 [54]	511	24-39	Dietary patterns and ovarian reserve parameters
P. Gromski et al., 2023 [55]	7,998	Mean 35.1	Elecsys AMH thresholds for ovarian response categories
G. Agnani et al., 2012 [56]	100	<38	AMH evaluation and initial ovarian response
J. Smitz et al., 2011 [57]	749	21-34	Baseline AMH correlating with ovarian response

Study	Sample Size	Age Range (years)	Primary Focus
N. Chimote et al., 2008 [58]	128	Not specified	Day zero AMH as better predictor
J. Kasia et al., 2019 [59]	70	38-42	AMH threshold for acceptable ovarian response
S. Rullan et al., 2015 [60]	116	18-43	Description of ovarian reserve in fertile women
M. Alebić et al., 2012 [61]	350	20-44	Discordances between AMH and AFC
I. V. van Rooij et al., 2005 [62]	81	Mean 39.6-43.6	AMH levels reflecting reproductive decline with age
T. Brodin et al., 2013 [18]	892	Not specified	AMH associated with live-birth rates
J. B. Scheffer et al., 2018 [63]	132	24-48	AMH and age as predictors of ovarian reserve
A. La Marca et al., 2017 [64]	578	Mean 37.6	AMH and euploid blastocyst rates
Cheng-Hsuan Wu et al., 2009 [12]	60	Not specified	AMH predicting ovarian response and cycle outcome

Study	Sample Size	Age Range (years)	Primary Focus
E. Elgindy et al., 2008 [65]	33	Not specified	AMH correlation during different menstrual phases
B. Wiweko et al., 2011 [13]	92	Not specified	AMH indicating ovarian response in IVF
V. Bernard et al., 2023 [19]	32 studies	Not specified	AMH predicting cumulative live birth
S. Broer et al., 2013 [66]	4,786	Not specified	Prediction of excessive response to IVF
Olivia Elizabeth Altamirano-Guerrero et al., 2025 [67]	120	20-45	Statistical analysis of age and ovarian function via AMH
S. Alson et al., 2018 [68]	454	<40	AMH levels associated with live birth rates
H. L. Khan et al., 2019 [69]	811	25-39	Natural fecundability trends in fertile and infertile women
Tie-Cheng Sun et al., 2022 [70]	521	21-46	Predictive levels of AMH for oocyte and embryo numbers

Study	Sample Size	Age Range (years)	Primary Focus
Kodali Lakshmi Mounika et al., 2024 [71]	141	19-45	Correlation of AMH with AFC in South Indian women
R. Satwik et al., 2012 [72]	198	<45	AMH cut-off values for predicting poor ovarian response
Xing Si et al., 2025 [73]	492	Not specified	Predictive model for AMH based on ultrasound
Min Hye Choi et al., 2011 [74]	370	20-42	AMH predicting ovarian response and IVF outcomes
Tamara Lerman et al., 2017 [11]	212	Not specified	Ovarian response to corifollitropin alfa
The Role of Anti-Müllerian Hor, 2025 [75]	156	18-40	AMH role in oocyte and embryo quality in IVF
Simantini Bose et al., 2024 [76]	158	21-35	Predictive limitations of AMH in ovarian response
T. Motawi et al., 2017 [77]	216	Mean 28-29	Gene polymorphisms and AMH in poor ovarian response
A. K. Styer et al., 2015 [78]	113	Not specified	Dynamic AMH levels during COH predicting outcomes

Study	Sample Size	Age Range (years)	Primary Focus
E. Ramadevi et al., 2022 [2]	60	25-40	Correlation of AMH, FSH, and AFC
Saima Wani et al., 2020 [79]	101	Mean 33.3	Ovarian reserve determination in different age groups
F. Martínez et al., 2013 [80]	172	18-35	AMH reducing low ovarian response in oocyte donors
S. Nelson et al., 2013 [20]	Not specified	Not specified	AMH versus antral follicle count

Sample sizes ranged from 26 participants [41] to 7,998 women [55], with the majority of studies including between 50 and 500 participants. Full text was available for 22 studies [2, 4, 5, 8, 16, 17, 25, 40, 41, 44, 46–49, 51, 54, 56–58, 63, 67, 75–77], while the remaining 58 studies were analyzed based on abstracts only.

AMH Measurement Protocols and Assay Characteristics

AMH measurement protocols varied considerably across studies, with timing of sample collection and laboratory methods representing critical sources of heterogeneity. The majority of studies measured AMH during the early follicular phase, typically on days 2-3 of the menstrual cycle [2, 4–6, 8, 16, 17, 24, 25, 31, 35, 44, 47, 48, 51, 54, 74, 79]. However, several investigations demonstrated that AMH can be measured at any time during the menstrual cycle [40, 71], though periovulatory variations were noted in some studies showing a statistically significant decrease from 5 days before to 2 days after ovulation [30].

Laboratory assay platforms demonstrated substantial diversity. The most commonly reported automated platforms included the Elecsys AMH immunoassay by Roche Diagnostics [37, 40, 42, 49, 51, 52, 55], the Beckman Coulter Access AMH assay [8, 47, 50, 57, 64], and the

ADVIA Centaur AMH assay [9]. Several studies employed ELISA-based methods [2, 4, 6, 24, 25, 43, 46, 54, 67, 77]. The electrochemiluminescence immunoassay technique was used in specific studies [35, 48, 59]. Quality control measures were explicitly reported in only a minority of studies. The Elecsys AMH assay demonstrated intra-assay and inter-assay coefficients of variation of less than 5.7% [40], while the Access AMH assay showed inter- and intra-variability of 5.4% and 5.6%, respectively [17]. For ELISA-based methods, intra- and inter-assay coefficients of variation were reported as less than 10% and 5%, respectively, in one study [75], and as 12.3% and 14.2% in another [74].

Notably, one study comparing three commercial AMH assays (Beckman Coulter, Roche Elecsys, and Ansh Labs) across three consecutive menstrual cycles revealed substantial longitudinal variation in AMH levels, with minimum differences ranging from 3.9 to 45.5 pmol/L depending on the assay [41]. This biological variability, combined with assay-specific differences, represents a critical consideration for clinical interpretation. A case of significant divergence between assays was observed, highlighting that commercial assays may occasionally fail to recognize specific AMH cleavage products [41].

Reference ranges and cutoff values varied widely across studies and assay platforms. For the Elecsys AMH assay, cutoff values of 6.4 pmol/L (0.89 ng/mL) for low ovarian response [40, 55] and 14.2 pmol/L (1.99 ng/mL) for high ovarian response [40, 55] were reported. For the Beckman Coulter Access AMH assay, a cutoff of 0.93 ng/mL was identified for predicting poor ovarian response with 90% specificity and 74.1% sensitivity [8]. Other studies reported varying thresholds: 1.1 ng/mL for poor ovarian response according to Bologna criteria [9, 59], 1.37 ng/mL as a general threshold for low response [7, 16], and 0.7 ng/mL as a threshold associated with reduced fecundability [28, 34, 69].

Correlation Between AMH and Ovarian Reserve Measures

AMH demonstrated consistently strong correlations with established measures of ovarian reserve, particularly antral follicle count (AFC). Correlation coefficients between AMH and AFC ranged from moderate to very strong across studies, with Spearman's rho or Pearson's r values frequently exceeding 0.5. Specifically, correlations of $r=0.77$ [23], $r=0.74$ [15, 39, 40], $r=0.81$ [44,

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63], $r=0.467$ [1], $r=0.54$ [3], $r=0.65$ [36], $r=0.68$ [37], $r=0.48$ [16, 57], $r=0.89$ [2], $r=0.844$ [73], and $r=0.663$ [71] were reported in individual studies. The strongest correlations were observed in studies using histological validation, with one investigation reporting a correlation of $\rho=0.75$ between AMH and primordial follicle count [46], and another showing correlations of $r=0.811$ (Elecsys), $r=0.844$ (Beckman Coulter), and $r=0.860$ (Ansh Labs) between AMH and AFC on specific cycle days [41].

The relationship between AMH and age demonstrated consistent negative correlations across all age groups studied. Studies reported age-related declines in AMH of 5.6% per year [27], 6% per year [69], with correlation coefficients ranging from $r=-0.30$ [3] to $r=-0.931$ [4]. The decline appeared to be particularly pronounced after certain age thresholds, with one study identifying approximately 31 years as the age cutoff for decline in fertile women and 34 years in infertile women [50].

AMH showed superior predictive accuracy compared to traditional markers such as basal FSH. In a large multicenter analysis, AMH demonstrated negative correlations with FSH ($r=-0.32$) [57], and multiple studies confirmed AMH's stronger association with ovarian response than FSH [4, 5, 8, 12, 13]. However, the relationship between AMH and FSH varied by age group, with statistical significance detected only in certain age ranges [25].

The correlation between AMH and number of oocytes retrieved in assisted reproductive technology cycles was particularly robust. Studies reported correlation coefficients ranging from $r=0.52$ to $r=0.885$ [12, 57], with multiple investigations confirming that AMH correlated more strongly with oocyte yield than AFC, FSH, or age [12, 22, 56, 74]. One study employing serial measurements during controlled ovarian hyperstimulation found that the day zero AMH level (measured after pituitary suppression) correlated even more robustly with oocyte retrieval ($r=0.8363$) compared to baseline AMH ($r=0.5221$) [58].

Predictive Accuracy of AMH for Ovarian Response Categories

AMH demonstrated excellent discriminatory ability for predicting extremes of ovarian response in assisted reproductive technology. For poor ovarian response, area under the curve (AUC) values consistently exceeded 0.75 across multiple studies. Reported AUC values included

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0.88 [5], 0.836 [7], 0.832 [6], 0.853 [11], 0.872 [10], 0.905 [26], and 0.929 [8]. Sensitivity and specificity varied with different cutoff values but generally demonstrated good performance: one large study reported sensitivity of 74.1% and specificity of 90% for predicting poor ovarian response [8, 8], while another found sensitivity of 82.4% and specificity of 82.4% at an AMH threshold of 0.91 ng/mL [11].

For predicting high or excessive ovarian response, AMH performed equally well with AUC values of 0.81 [5], 0.871 [11], 0.890 [7], 0.897 [26], 0.901 [10], and 0.91 [9]. At an AMH threshold of 3.52 ng/mL, sensitivity of 89.5% and specificity of 83.8% were achieved for identifying excessive responders [7]. Another study found that an AMH threshold of 2.58 ng/mL predicted high response with sensitivity of 80.0% and specificity of 82.1% [11].

The predictive performance of AMH for suboptimal or normal ovarian response categories was more modest. Studies specifically examining intermediate response categories reported lower AUC values, ranging from 0.378 to 0.682 [76], suggesting that AMH is more effective at identifying the extremes of ovarian response rather than intermediate categories.

Comparative Performance: AMH versus AFC and Other Markers

The relative predictive superiority of AMH versus AFC varied substantially across studies, with important age-related and population-specific patterns emerging. In younger women (≤ 35 years), multiple studies found that AMH and AFC performed comparably in predicting ovarian response, with similar AUC values [6, 8, 15, 26, 47]. However, in women over 35 years of age, AMH consistently demonstrated superior predictive accuracy. One multicenter study reported that in women >35 years, AMH (AUC=0.858) significantly outperformed AFC (AUC=0.675) in predicting suboptimal ovarian response ($p<0.001$) [15]. This age-dependent differential performance is particularly relevant for clinical decision-making in older reproductive-age women.

Several large studies comparing multiple ovarian reserve markers simultaneously found that AMH emerged as the single best predictor. In a study of 331 patients, AMH showed the strongest correlation with oocyte yield, with AFC being the strongest single predictor overall but AMH performing nearly as well [6]. Another investigation of 162 patients undergoing their first IVF cycle

concluded that both AMH and AFC were comparable predictors of oocyte yield and good-quality embryos, but AMH performed better in predicting live birth [22].

The reproducibility and stability of AMH measurements represent a significant advantage over AFC. A prospective study measuring markers across three consecutive menstrual cycles found that AMH demonstrated significantly higher reproducibility (ICC=0.89) than inhibin B (ICC=0.76), FSH (ICC=0.55), estradiol (ICC=0.22), and AFC (ICC=0.73) [14]. This superior consistency suggests that AMH provides more reliable information across multiple assessments.

Multivariate prediction models combining AMH with other markers generally performed better than single markers alone. Studies employing logistic regression or multiple regression analysis found that combining AMH with AFC improved prediction of poor ovarian response [6, 7], though the magnitude of improvement varied. One investigation reported that a model with female age, AFC, and AMH achieved an AUC of 0.85, while AMH and AFC without age showed similar accuracy [66]. Another study found that AFC and AMH together explained 50.9% of variation in ovarian response, compared to 47% for AMH alone [40].

AMH and Clinical Pregnancy/Live Birth Outcomes

The relationship between AMH levels and pregnancy outcomes demonstrated more complex patterns than the relationship with oocyte yield. Multiple studies found that while AMH strongly predicted ovarian response, its ability to predict clinical pregnancy or live birth was more modest. One large prospective cohort of 892 women undergoing 1,230 IVF-ICSI cycles found that live-birth rates increased log-linearly from 10.7% for AMH <0.84 ng/mL to 30.8% for AMH >2.94 ng/mL ($p<0.0001$) [18], with AMH remaining significantly associated with live birth even after adjustment for age and oocyte yield [18]. Another prospective study of 454 patients found that women with live birth had higher median AMH (26 pmol/L) compared to those without (22 pmol/L), with live birth rates increasing by 8% per AMH group ($p=0.015$) [68].

However, the mechanism by which AMH influences pregnancy outcomes appears to operate primarily through oocyte quantity rather than quality. Several studies confirmed that AMH's association with cumulative live birth was mediated by the well-defined relationship between AMH and oocyte yield, which determines the number of blastocysts available for transfer [19, 20]. This

indirect pathway suggests that very low AMH levels predict poor pregnancy outcomes primarily because of insufficient oocyte numbers rather than compromised oocyte quality.

In the context of natural fertility, one community-based study of 750 women without known infertility found no significant difference in time to pregnancy between women with normal AMH levels and those with low AMH levels (defined as ≤ 0.7 ng/mL) [34]. Among 100 women aged 30-44 years attempting natural conception, those with serum AMH ≤ 0.7 ng/mL had significantly reduced fecundability (fecundability ratio 0.38; 95% CI 0.08-0.91) compared to women with higher AMH [28]. These divergent findings highlight that the predictive value of AMH for natural fertility may differ from its predictive value in assisted reproduction contexts.

Regarding embryo quality and genetic competence, one retrospective analysis of 578 couples undergoing IVF/ICSI with preimplantation genetic screening found a strong positive age-independent relationship between AMH level and the rate of euploid blastocysts [64]. Another study of 2,564 IVF/ICSI cycles with PGT-A found that AMH levels positively correlated with euploid blastocyst rate ($p < 0.001$), though the clinical significance of this association requires further validation [53].

Population-Specific Considerations and Subgroup Analyses

Age-stratified analyses revealed important differences in AMH's predictive performance across reproductive age ranges. Studies consistently demonstrated that the utility and interpretation of AMH values must be contextualized by patient age. In women under 35 years, AMH and AFC showed similar predictive accuracy [15], with both markers effectively identifying poor responders. However, in women aged 35-40 years and particularly those over 40 years, AMH emerged as a more reliable predictor [15, 78]. One study found that the rate of AMH decline during controlled ovarian hyperstimulation was particularly predictive in women older than 35 years, with adjusted odds ratio of 6.95 (95% CI 1.09-44.1) for clinical pregnancy [78].

Ethnic and geographic variations in AMH levels and their predictive performance have been documented. A study in Southeast Asian women in Singapore established population-specific cutoff values: AMH ≤ 0.69 ng/mL for poor response and ≥ 3.06 ng/mL for excessive response [17]. A study of African women in Cameroon found that AMH and AFC remained significant predictors of

ovarian response, with AFC maintaining significance in multivariate analysis [48]. These findings emphasize the importance of establishing population-specific reference ranges rather than applying universal cutoffs.

Body mass index (BMI) emerged as a potential confounding factor in several studies. One investigation found that BMI appeared to alter markers of ovarian reserve, though not statistically significantly [60]. Another study stratified by BMI categories and found that higher adherence to prudent dietary patterns in obese women was associated with significantly higher AFC ($p=0.03$) and AMH ($p=0.05$) [54]. These observations suggest that metabolic factors may modulate the AMH-ovarian reserve relationship.

Studies specifically examining women with diminished ovarian reserve demonstrated that AMH retains predictive value even at very low levels. In a cohort of 107 women with serum AMH ≤ 12 pmol/L, pre-treatment AMH significantly predicted failure to reach hCG triggering criteria (OR 0.71 per unit increase, 95% CI 0.59-0.85, $p<0.01$) [49]. Notably, the lowest AMH value compatible with live birth in this study was 1.3 pmol/L [49], indicating that even extremely low AMH levels do not completely preclude successful pregnancy outcomes.

Discordance Between AMH and AFC

A substantial proportion of women demonstrated discordance between AMH levels and AFC, representing a significant clinical challenge. In a large analysis of 5,354 women, one in five had discordant AMH and FSH values, with the frequency of discordance being highly age-dependent [39]. Specifically, of women with reassuring FSH values (<10 IU/mL), concerning AMH values (<0.8 ng/mL) were found in one in five women overall, ranging from one in 11 women under 35 years to one in 3 women over 40 years [39, 39].

The mechanisms underlying AMH-AFC discordance vary by AFC category. In women with low AFC (≤ 6 follicles), the highest proportion of discordance was attributable to AFC undercounting (76.9%), while in the intermediate AFC group (7-20 follicles), the highest proportion involved AFC overcounting (51.3%) [61]. This suggests that operator-dependent measurement error in AFC assessment may be a primary driver of discordance, particularly in women with fewer visible follicles.

Age-specific patterns of AMH-AFC agreement also emerged. One study examining women aged 25-45 years found that in women under 40 years, AMH >1 ng/mL was a good predictor of AFC >7 (Kappa=0.4510, $p=0.0088$), but this agreement was lost in women over 40 years using the same cutoff values [35]. This age-related deterioration in concordance suggests that different thresholds or combined assessment strategies may be needed for older women.

Synthesis: Reconciling Heterogeneity in AMH Performance

The observed heterogeneity in AMH's predictive performance across studies can be largely explained by four key factors: assay methodology, population characteristics, treatment protocols, and outcome definitions.

Assay-Related Factors: Studies employing automated platforms (Elecsys, Access) generally reported more consistent results than those using manual ELISA methods [40, 42, 47, 51]. The introduction of high-specific AMH assays targeting distinct molecular isoforms has shown promise for improving prediction in women with low ovarian reserve, with the AL-196 assay demonstrating the highest correlation with oocyte yield ($r=0.60$ for COCs and $r=0.59$ for MII oocytes) [51]. However, the lack of standardization across assays means that cutoff values established for one platform cannot be directly applied to another [39, 41].

Age and Ovarian Reserve Margins: AMH performs best at the extremes of ovarian reserve and shows age-dependent differential performance. In women with clearly diminished reserve (AMH <1 ng/mL) or elevated reserve (AMH >3.5 ng/mL), prediction is robust regardless of age [7, 17, 40, 55]. However, in the intermediate range (AMH 1-3 ng/mL), predictive accuracy diminishes, particularly in women over 35 years [15, 76]. This pattern suggests that both age-related decline in oocyte quality and the narrower dynamic range of AMH in mid-range values contribute to reduced predictive power.

Treatment Protocol Effects: The type of gonadotropin used for ovarian stimulation influences the AMH-response relationship. One large RCT found that while AMH predicted oocyte yield in both HP-hMG and rFSH groups, the correlation was stronger with rFSH ($r=0.59$) than HP-hMG ($r=0.52$) [57], with significantly higher excess response rates in the rFSH group among high-AMH patients [57]. Similarly, AMH measured after pituitary suppression (day zero) showed

stronger correlations with oocyte yield than baseline AMH [58], suggesting that hormonal milieu affects both AMH secretion and follicular responsiveness.

Outcome Measure Specificity: AMH demonstrates differential predictive ability depending on the outcome of interest. For quantitative outcomes (oocyte number, follicle count), AMH performs excellently with AUC values typically exceeding 0.80 [5, 7, 8, 10, 11, 40]. For categorical classifications of response, prediction remains strong at the extremes (poor and high response) but weakens for intermediate categories [55, 76]. For pregnancy outcomes, AMH shows modest direct predictive ability (AUC 0.56-0.63) [68], though it influences cumulative live birth indirectly through oocyte quantity [19, 20].

These patterns collectively suggest that AMH functions as an accurate quantitative marker of the ovarian follicle pool size, with prediction being most robust when:

- Assay measurement is standardized and automated
- Patient age and baseline reserve align with established cutoff thresholds
- Treatment protocols account for differential gonadotropin sensitivity
- Outcomes focus on quantitative measures rather than qualitative endpoints

When these conditions are not met, the predictive accuracy of AMH decreases, though it typically remains superior to traditional markers such as basal FSH or age alone.

DISCUSSION

This systematic review of 80 studies provides comprehensive evidence that AMH serves as a robust predictor of ovarian reserve in reproductive-age women undergoing fertility evaluation, with performance characteristics that vary predictably based on assay methodology, patient age, outcome measure, and clinical context.

Correlation with Established Ovarian Reserve Markers

The consistently strong correlation between AMH and AFC observed across studies ($r=0.48-0.89$) validates AMH as a quantitative marker of the ovarian follicular pool (1,13,18). The

strongest correlations were observed in studies employing rigorous methodology, including standardized ultrasound protocols and automated AMH assays (19,20). Notably, the correlation with histological primordial follicle count ($\rho=0.75$) provides direct validation that serum AMH reflects the non-growing follicle pool, the true measure of ovarian reserve (21). This histological confirmation is particularly significant as it establishes biological plausibility for AMH as a reserve marker beyond its correlation with ultrasound-derived measures.

The negative correlation between AMH and age ($r=-0.30$ to -0.93) across all studies confirms the expected age-related decline in ovarian reserve (3,22). The reported decline rates of 5.6-6% per year align with established understanding of follicular atresia rates (23). However, the identification of age thresholds (approximately 31 years in fertile women, 34 years in infertile women) where decline accelerates has important clinical implications for counseling women about reproductive timing (24).

AMH's superior reproducibility compared to other markers (ICC=0.89 for AMH versus 0.73 for AFC and 0.55 for FSH) represents a significant clinical advantage (9). This stability means that a single AMH measurement provides reliable information, whereas fluctuating FSH levels may require repeated testing. The biological basis for this stability lies in AMH's continuous, non-cyclical secretion from growing follicles, independent of gonadotropin regulation (10).

Predictive Accuracy for Ovarian Response

The excellent discriminatory ability of AMH for predicting extremes of ovarian response (AUC 0.75-0.93 for poor response; AUC 0.81-0.91 for high response) supports its use for individualized treatment planning (5,7,8,25). For poor responders, AMH enables identification of women who may benefit from modified stimulation protocols or alternative treatment strategies. The identification of women at risk for excessive response is equally important for preventing ovarian hyperstimulation syndrome, particularly with cutoff values around 3.5 ng/mL demonstrating good sensitivity and specificity (7,26).

The more modest predictive performance for intermediate response categories (AUC 0.378-0.682) reflects the biological reality that AMH, as a quantitative marker of follicle number, cannot fully predict individual variation in follicular sensitivity to gonadotropins (27). This limitation is

clinically relevant because most patients fall into intermediate response categories, where additional clinical judgment is required.

Comparative Performance: AMH versus AFC

The age-dependent differential performance between AMH and AFC represents one of the most clinically significant findings of this review. In women under 35 years, AMH and AFC perform comparably, supporting the use of either marker in younger populations (6,8,28). However, the superior performance of AMH in women over 35 years (AUC 0.858 vs. 0.675) suggests that AMH should be the preferred marker in older reproductive-age women (14). Several factors may explain this age-related divergence: (1) AFC becomes technically more difficult in older women due to smaller, less distinct follicles; (2) AMH may better reflect the declining quality of the remaining follicle pool; (3) the broader dynamic range of AMH in older women provides better discrimination.

The finding that AMH outperforms AFC in multivariate models including age suggests that AMH captures age-related decline beyond chronological age alone (29). This is biologically plausible because AMH reflects both the quantitative and qualitative aspects of ovarian aging, whereas AFC primarily reflects quantity.

AMH and Pregnancy Outcomes

The modest direct predictive ability of AMH for pregnancy outcomes (AUC 0.56-0.63) requires careful interpretation (16). The observation that live birth rates increase log-linearly with AMH (from 10.7% at AMH <0.84 ng/mL to 30.8% at AMH >2.94 ng/mL) confirms that very low AMH portends poor prognosis (17). However, the finding that AMH's effect on cumulative live birth is mediated through oocyte quantity rather than quality has fundamental implications (30,31). This indicates that AMH predicts the number of opportunities for conception (more oocytes yielding more embryos) rather than the competence of individual oocytes.

The divergent findings regarding natural fertility—where one study found no association between low AMH and time to pregnancy while another found significantly reduced fecundability—highlight that AMH's predictive value differs between natural and assisted conception contexts (32,33). In natural fertility, monthly fecundity may be preserved until follicle

numbers become critically low, whereas in ART, the quantitative advantage of more oocytes directly translates into more embryos for transfer.

Discordance Between AMH and AFC

The finding that one in five women demonstrate discordance between AMH and AFC represents a clinically significant phenomenon requiring systematic investigation (34). The age-dependent increase in discordance (from 1 in 11 women under 35 to 1 in 3 women over 40) suggests that discordance becomes more clinically relevant in older patients, precisely when accurate assessment is most critical (34).

The identification of distinct mechanisms underlying discordance based on AFC category has practical implications. In women with low AFC, undercounting appears primary, suggesting that AMH may be more reliable in this group. In women with intermediate AFC, overcounting predominates, potentially due to misinterpretation of non-follicular ovarian structures (35). These findings support using AMH as the primary marker with AFC as confirmatory, particularly in cases of suspected discordance.

The loss of AMH-AFC agreement in women over 40 years using standard cutoffs indicates that age-specific thresholds are necessary (36). This may reflect changes in follicle characteristics or AMH production per follicle in aging ovaries, emphasizing that universal cutoffs across all ages are inappropriate.

Assay-Related Heterogeneity

The substantial diversity in AMH assay platforms represents a critical source of heterogeneity limiting clinical applicability. The introduction of automated platforms (Elecsys, Access, ADVIA Centaur) has improved reproducibility compared to manual ELISA methods, with coefficients of variation consistently below 6% for automated assays compared to up to 14% for ELISA (19,20,37). However, the demonstration that different commercial assays may yield clinically significant differences in individual patients—including failure to recognize specific AMH cleavage products—highlights that assay selection matters (38).

The biological variability in AMH across menstrual cycles, with minimum differences ranging from 3.9 to 45.5 pmol/L depending on assay, further complicates interpretation (38). This

variability likely reflects true biological fluctuation rather than assay error, suggesting that single measurements, while generally reliable, may occasionally misclassify patients near clinical thresholds.

The lack of standardized reference ranges across assays means that cutoff values established for one platform cannot be directly applied to another (34,38). This has practical implications for clinical practice, where laboratories may change assays without updating clinical decision thresholds.

Population-Specific Considerations

The identification of ethnic and geographic variations in AMH levels and predictive performance emphasizes the need for population-specific reference ranges (39,40). The establishment of Southeast Asian-specific cutoffs (≤ 0.69 ng/mL for poor response, ≥ 3.06 ng/mL for excessive response) differs from Western populations, potentially reflecting genetic, environmental, or nutritional factors (39). Similarly, the validation of AMH prediction in African populations supports global applicability but reinforces the need for local validation (40).

The influence of BMI and dietary patterns on AMH levels suggests that metabolic factors modulate the AMH-ovarian reserve relationship (41,42). The association between prudent dietary patterns and higher AMH in obese women raises the possibility that lifestyle modifications might influence ovarian reserve markers, though whether this reflects true changes in reserve or modulation of AMH production per follicle requires investigation.

Clinical Implications

These findings support the integration of AMH into routine fertility evaluation with several important considerations. First, AMH should be interpreted using assay-specific, age-stratified reference ranges rather than universal cutoffs. Second, AMH provides optimal prediction for quantitative outcomes and extremes of response, with more limited value for intermediate categories and pregnancy prediction. Third, in women over 35 years, AMH should be preferred over AFC as the primary ovarian reserve marker. Fourth, discordance between AMH and AFC should prompt consideration of technical factors and may warrant repeat assessment or alternative testing.

For clinical decision-making, AMH enables: (1) individualized gonadotropin dosing to optimize response and minimize risk; (2) identification of poor responders who may benefit from alternative protocols; (3) recognition of hyper-responders requiring modified stimulation to prevent OHSS; (4) realistic counseling about expected oocyte yield; and (5) prognostic information for treatment planning.

CONCLUSION AND RECOMMENDATIONS

This systematic review establishes that AMH demonstrates strong, consistent correlation with ovarian reserve markers in reproductive-age women undergoing fertility evaluation, with performance characteristics supporting its role as a primary clinical tool. The key findings are:

1. AMH shows strong to very strong correlation with AFC ($r=0.48-0.89$) and histological primordial follicle count ($p=0.75$), validating it as a quantitative marker of the ovarian follicular pool.
2. AMH exhibits excellent predictive accuracy for extremes of ovarian response (AUC 0.75-0.93 for poor response; AUC 0.81-0.91 for high response), supporting its use for individualized treatment planning.
3. In women over 35 years, AMH demonstrates superior predictive performance compared to AFC, making it the preferred marker in older reproductive-age women.
4. AMH's superior reproducibility (ICC=0.89) compared to traditional markers provides practical advantages for clinical implementation.
5. The relationship between AMH and pregnancy outcomes is modest and mediated through oocyte quantity rather than quality, indicating that AMH predicts the number of opportunities for conception rather than oocyte competence.
6. Discordance between AMH and AFC occurs in approximately 20% of women, increases with age, and requires systematic clinical approach.

7. Assay-related heterogeneity necessitates platform-specific reference ranges and recognition that cutoffs are not interchangeable across assays.
8. Population-specific factors including ethnicity, BMI, and dietary patterns influence AMH levels and predictive performance, requiring locally validated reference ranges.

Recommendations for Clinical Practice:

- Use AMH as the primary ovarian reserve marker in women over 35 years
- Employ assay-specific, age-stratified reference ranges
- Interpret AMH in context of quantitative outcomes rather than pregnancy prediction
- Investigate discordance between AMH and AFC when present
- Consider repeat testing when values near clinical thresholds

Recommendations for Future Research:

- Develop internationally standardized AMH assay calibrations
- Establish population-specific nomograms across diverse ethnic groups
- Conduct prospective studies examining AMH-guided treatment algorithms
- Investigate mechanisms underlying AMH-AFC discordance
- Evaluate the role of AMH in natural fertility across reproductive lifespan
- Assess cost-effectiveness of AMH testing in various clinical contexts
- Examine the influence of environmental and lifestyle factors on AMH production
- Develop integrated prediction models combining AMH with novel biomarkers

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