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Mixed Methods Studies Using Secondary Analysis in Nursing and Midwifery: A Methodological Review

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ABSTRACT

Aim: To identify mixed methods studies in nursing and midwifery using secondary analysis and to examine their methodological characteristics.

Design: Methodological review.

Methods: A systematic search was conducted to identify empirical mixed methods studies in nursing and midwifery that used secondary analysis. A data extraction sheet was developed based on previous methodological reviews of secondary analysis and mixed methods.

Data Sources: SCOPUS, Web of Science and CINAHL were searched from inception to March 10, 2023. Supplementary searches were conducted in two methodological journals and six nursing journals.

Results: A total of 26 mixed methods studies published between 2000 and 2022 were included in the review. Of these, only 13 studies explicitly mentioned the type of mixed methods design used. Twenty studies showed evidence of integration of the quantitative and qualitative components. Most of these studies integrated the components at the interpretation stage, whereas fewer integrated the components during data collection. None of the studies mentioned the rationale for using secondary analysis in the context of a mixed methods study.

Conclusion: The included studies demonstrated fairly good reporting of mixed methods features, although they generally lacked a rationale for the use of secondary data.

Implications for the profession and/or patient care: Adequate reporting of mixed methods studies using secondary analysis is essential in order to allow readers to assess whether secondary analysis was appropriately incorporated into a mixed methods study and whether the potential of secondary analysis was fully exploited.

Impact: This review provides a set of recommendations to transparently report information regarding the research process and results obtained in mixed methods studies using secondary analysis.

Reporting Method: Items relevant to methodological reviews included in the PRISMA Extension for Scoping Reviews (PRISMA-ScR) were considered for reporting the review.

Summary

- What is already known
  - Mixed methods research is widely recognised for its potential to generate evidence-based, context-specific nursing knowledge.
  - Secondary analysis can help to overcome some of the challenges inherent in mixed methods research and to address questions that cannot be investigated using primary data alone.
  - Despite the potential benefits, little is known about how secondary analysis is used in mixed methods studies.
- What this paper adds
  - The use of secondary analysis in mixed methods research in nursing and midwifery is still limited, despite a marked increase in recent years in the use of this approach.
  - In most of the studies included in this review, integration of the quantitative and qualitative components was undertaken and reported at either the data collection, or else the interpretation stage, or both.
  - Most studies did not show adequate reporting of the characteristics of the secondary analysis used, particularly with regard to the rationale for using secondary analysis as part of the mixed methods design.
- Implications for practice and policy
  - A number of recommendations are proposed for the reporting of mixed methods studies that make use of secondary analysis.
  - These recommendations will need to be refined in future research in order to enable researchers demonstrate the full potential of the use of secondary analysis in mixed methods research.

1 | Introduction

Researchers conducting mixed methods research (MMR) are able to gather and analyse quantitative and qualitative data following a design that establishes the internal logic of both components—including the purpose of each, the priority of one over the other and the point of integration. Furthermore, researchers can integrate the data from the two components in one or more phases of the study in order to gain an understanding of the phenomena under study that is deeper than what could be achieved using monomethod designs (Creswell and Plano Clark 2018; Fetters 2020). In health-related disciplines, MMR can be a particularly useful way of capturing the complexity of health phenomena, addressing the multifaceted nature of the challenges faced by health professionals in clinical practice and generating knowledge that is readily transferable to practice (Chandanabhumma et al. 2023; Guével and Absil 2022; Halcomb and Hickman 2015).

Despite these advantages, the design and implementation of MMR can be hampered by structural barriers, such as the need to have researchers with the skills needed to adequately conduct quantitative and qualitative data collection; time and financial constraints resulting from the need to collect both types of data; and the reluctance of some funding bodies to support MMR (Dalpoas and Shermock 2021; O'Cathain, Nicholl, and Murphy 2009). In such cases, researchers may recur to the approach of secondary data analysis, that is, the analysis of existing data in order to answer research questions different from those of the original study, or else, to provide more precise answers to the original research questions by incorporating more elaborate forms of analysis or new techniques (Hewson 2006; Polit and Beck 2020; Watkins 2022).

2 | Background

2.1 | Advantages and Disadvantages of Secondary Data Analysis

Secondary data analysis can aid researchers in many ways. First, it offers free access to large, high-quality data sets obtained from databases of funding agencies, government bodies and healthcare organisations. These data sets, usually based on large samples, are often more representative of the general population because of their depth, breadth and size (Johnston 2017). Therefore, their use can be beneficial when limited time and resources are a significant factor (Chatfield 2020; Smith et al. 2011; Weston et al. 2019). Second, secondary analysis can help researchers study complex or sensitive topics, for which it may be difficult to collect primary data. For instance, secondary data may be the only option for researchers wishing to examine rare clinical events or address controversial issues, such as mental health, end-of-life care and domestic and sexual violence (Heap and Waters 2019; O'Connor 2020; Thorne 1998). Third, secondary analysis can facilitate specific types of analyses, such as subgroup, longitudinal and cross-cultural analyses, and it can allow researchers to reanalyse a data set from a different perspective, helping them find new interpretations of the data (DuBois et al. 2023). Fourth, it can alleviate the participant fatigue that sometimes results from repeated data collection by allowing researchers to avoid collecting additional data from participants, particularly from vulnerable or hard-to-reach populations (Chatfield 2020; Long-Sutehall, Sque, and Addington-Hall 2011). Fifth, secondary analysis can be a valuable tool for conducting large international cross-country and cross-cultural health studies, making use of large-scale government health surveys or administrative and clinical data to answer comparative research questions. For example, archived data may be used by researchers to conduct longitudinal comparisons in order to examine the impact of cultural variables on health phenomena across countries and cultures (Van de Vliert 2011).

Despite these advantages, secondary data analysis may also entail some disadvantages. First, the data may be inaccurate or incomplete owing to problems in the data collection process. Unlike large public databases, data from small-scale studies is more likely to contain inaccuracies if the primary researchers did not adhere to basic standards of rigour. If the primary investigator is unavailable or cannot be contacted, this poses an additional challenge for secondary researchers

(Windle 2010). Second, despite the obvious time savings associated with not developing new data sources, secondary researchers may need a significant amount of time to familiarise themselves with the organisation of the data, particularly for large and complex data sets (Corti 2022). Third, this type of analysis may induce researchers to analyse or interpret primary data in a way that is inappropriate, since such analysis is often carried out by researchers who were not involved in the collection of the primary data and who may have a more distant relationship with the data (Hammersley 2010). For example, in quantitative secondary data analysis, researchers may be unaware of the limitations of the primary data set and, consequently, of the types of analyses that may be appropriate (Dale, Wathan, and Higgins 2022). In qualitative secondary analysis, the social, cultural and political contexts in which the primary study was conducted may not be well understood by researchers. Consequently, these researchers may explore inappropriate research questions or use methods of analysis that could lead to misinterpretation of the original findings (Ruggiano and Perry 2019).

2.2 | Importance of Secondary Analysis in Mixed Methods Research

According to Watkins (2022), MMR using secondary data involves 'identifying, evaluating, and incorporating either one or more existing data sources into one or more components for a mixed methods project' (p. 26–27). While the literature on secondary analysis has generally focused on quantitative and qualitative methods, this strategy can confer a number of benefits in MMR studies. First, the savings in time and resources entailed in the use of existing data are particularly relevant to MMR, since these studies are frequently time-consuming and costly, and these factors that have been cited as potential barriers to conducting MMR (Bryman 2007; Creswell and Plano Clark 2018). Second, as argued by Watkins (2022), including qualitative secondary data in an MMR study can help researchers 'gauge the depth of a topic so [they] know how to proceed quantitatively' (p. 28), and including quantitative secondary data can help researchers 'gauge the breadth of a topic so [they] know how to proceed qualitatively' (p. 28). For example, an existing, open-ended qualitative data set with great richness and depth might help researchers generate valuable tools and key variables for testing in quantitative research. Third, researchers can combine secondary and primary data in ways that leverage the individual strengths of each data type while minimising the individual limitations, thus overcoming the problems involved in using either primary or secondary data alone (Heap and Waters 2019). In such a case, researchers might decide to collect primary data to answer a very specific research question—which could not be answered with secondary data—while simultaneously using a high-quality, large secondary data set to answer a broad research question—which could not be answered with primary data. Fourth, the use of secondary analysis in MMR can be particularly beneficial in certain geographic contexts, such as developing countries or those with a low level of investment in research, where certain logistical challenges associated with MMR are likely to be exacerbated when there is only a limited research infrastructure or when their context results in increased difficulties when conducting activities related to sampling and fieldwork (Harris 2022).

2.3 | Rationale for the Review

While secondary data are used frequently in qualitative and quantitative research and while ample guidance is available to help researchers design and execute robust secondary data analysis in both quantitative and qualitative methodological approaches (Beck 2019; Chatfield 2020; MacInnes 2020; Ruggiano and Perry 2019), the literature provides only limited guidance for the task of carrying out MMR when such data are used (Watkins and Johnson 2022). This dearth of available tools to guide the practice of researchers can be problematic since the use of secondary data entails several significant challenges, as explained above. Some of these challenges may be exacerbated in MMR, thus undermining the ability of this type of research to generate robust and useful nursing knowledge. As Watkins (2022) explained, researchers have not yet thoroughly explored the benefits and limitations of using secondary data in MMR designs. In addition, although secondary data analysis in MMR can provide valuable insights into nursing and healthcare phenomena, existing research using this approach has not been systematically reviewed. To address these gaps, this methodological review aimed to provide a systematic examination of secondary data analysis in MMR research in nursing and midwifery in order to contribute to a better understanding of the methodology in question and its application in nursing and health care.

3 | Aim

To identify MMR studies in nursing and midwifery in which one or more of the quantitative and/or qualitative components of the study involved secondary data analysis and to examine how these studies were designed, conducted and reported.

4 | Methods

4.1 | Design

We conducted a methodological review, defined by Aguinis, Ramani, and Alabduljader (2023) as a type of review that formally or informally examines the literature on practice with respect to methods and methodological issues, synthesises the literature and provides recommendations for improving practice. Methodological reviews are particularly useful when, as in this case, the state of the art in the use of a methodological approach in a particular area is unknown and specific guidance may be needed to advance and strengthen future practice (Khalil and Munn 2023). The methodology employed in the review was based on the guidance for conducting methodological studies described by Mbuagbaw et al. (2020). In addition, since there are no specific published guidelines for reporting methodological reviews, we used the items relevant to methodological reviews included in the PRISMA Extension for Scoping Reviews (PRISMA-ScR) (Tricco et al. 2018). Due to its methodological nature, the review was not preregistered.

4.2 | Search Strategy

We systematically searched the literature to identify empirical MMR studies using secondary analysis in the fields of nursing and midwifery. We searched the Scopus, Web of Science Core Collection and CINAHL databases from inception to March 10, 2023, when the search was conducted. These databases were selected both for their broad coverage of journals (in the case of Scopus and Web of Science) and for their content relevance to nursing and midwifery (in the case of CINAHL). We used combinations of terms related to the concepts of secondary analysis (e.g., 'secondary analysis', 'secondary data') and MMR (e.g., 'mixed method*', 'multimethod', 'multiple research method', 'mixed study', 'mixed approach', 'quantitative' and 'qualitative'). The terms related to MMR, which have been used in previous reviews (De Allegri et al. 2018; Fàbregues et al. 2022; Granikov et al. 2020), were intended to be broad enough to ensure that studies that were not explicitly self-identified as MMR but met the criteria for such studies would be captured. The full electronic search strategy is presented in Supplementary File S1. After downloading the search results, we employed a modified version of the Bramer method (Bramer et al. 2016) using EndNote software version 21 to remove duplicates. The Bramer method is a systematic, rigorous and reproducible step-by-step method for removing duplicate references that has been proven to be highly accurate (Bramer et al. 2016). In addition, after applying the method, we manually checked the remaining references to ensure that no duplicates were missed. This systematic search was supplemented by a hand search of the *Journal of Mixed Methods Research, International Journal of Multiple Approaches, International Journal of Nursing Studies, Western Journal of Nursing Research, Journal of Advanced Nursing, Journal of Clinical Nursing, Nursing Research and Research in Nursing and Health*. The hand search was conducted for the period from January 2007 to March 2023.

4.3 | Study Selection

To select studies for review, we used the inclusion and exclusion criteria shown in Table 1. Initially, two independent reviewers (SF and SI) conducted a pilot test of the criteria on 200 randomly selected studies (10% of the sample), and the criteria were revised for greater clarity following a discussion between the two reviewers. Most disagreements pertained to the determination of whether the studies in question employed an MMR approach. This led to the formulation of a more precise definition of MMR and the addition of additional exclusion criteria. Subsequently, the same two reviewers independently screened the titles and abstracts of all publications during the screening phase. In the eligibility phase, the two reviewers independently assessed the full text and recorded the reasons for exclusion. Any disagreements that arose at any stage were resolved through consensus.

4.4 | Data Extraction

Deductive qualitative content analysis, based on Schreier (2012), was employed for data extraction and analysis. Initially, a data extraction sheet was developed to extract information on the methodological design, execution and reporting of each of the included articles. The extraction sheet included general information about the study (authors, publication year and study purpose), characteristics of the study specific to secondary analysis (i.e., terms used to describe the secondary analysis, the source of secondary data, the citation of the parent study, the type of secondary data analysed, the type

TABLE 1 | Inclusion and exclusion criteria.

Inclusion criteria	Exclusion criteria
• Research with a primary focus on topics in the field of nursing and midwifery. • Empirical studies. • Involve the use of quantitative and qualitative data and the use of quantitative and qualitative analyses. • Involve the use of secondary data analysis in one or more of the components of the MMR study. Secondary data analysis is defined as the reanalysis of an existing data set, either by the original researcher or another individual, to address new or slightly different questions or to address the same questions using different methods of analysis (Hakim 1982; Szabo and Strang 1997). • In English language. • Peer-reviewed journal articles.	• Research whose primary focus is not nursing and midwifery. • Nonempirical publications, including theoretical and nonempirical methodological papers, editorials, commentaries, letters sent to the editor and book reviews. • Publications reporting a systematic review. • Dissertations, books or book chapters • Do not include the use of secondary data analysis. • Empirical studies reporting the use of either quantitative or qualitative research solely. • Empirical single method studies that report studies based on secondary analysis of surveys with closed and open-ended questions or interviews with a quantitative instrument (i.e., intramethod data collection). • Empirical single method studies that report studies in which the information from one qualitative secondary data source is analysed quantitatively (i.e., data transformation). • Empirical articles based on MMR studies that report only either the quantitative component or the qualitative component. • Studies in which the secondary data sources analysed are published reports, newspaper articles, or similar. • Full text not available.

Abbreviation: MMR = mixed methods research.

of analytical methods employed, information about ethical approval for secondary analysis, information about strategies to ensure rigour and information about limitations of secondary data) and MMR features (cited MMR literature, justification for using MMR, quantitative and qualitative procedures, type of MMR design, point and evidence of integration and insights gained from using MMR). The categories used to extract information about the secondary analysis features were based on a previous review of the use of secondary analysis in qualitative research (Ruggiano and Perry 2019), while those related to the MMR features were based on several reviews on the use of MMR in several disciplinary fields conducted by some of the authors of this review (Fàbregues et al. 2022, 2023). The extraction sheet was pilot tested through data extraction from five studies. The inter-rater agreement during the pilot test was estimated at 98%, which is considered a very high level of agreement (McHugh 2012). Two researchers (AY and SF) independently extracted passages from the included articles using the extraction sheet in Excel. Disagreements were resolved through consensus. The extracted passages were subsequently reviewed and summarised using literature summary tables (Younas and Ali 2021), followed by frequency analyses to determine the number of occurrences for each variable.

To develop a typology of the insights gained from using MMR, we used Stapley, O'Keeffe, and Midgley's (2021) ideal-type analysis method. Following the steps that those authors recommended, we analysed the previously extracted passages that provided justification for using MMR in the study and demonstrated evidence of integration. The steps included becoming familiar with the extracted passages of each included study, preparing a summary of these passages, systematically comparing the summaries to create clusters of similar studies on the basis of each MMR insight, and generating descriptions of the resulting MMR insight types. The analysis continued until all the team members agreed to the interpretation of the results.

5 | Findings

The search in the databases, including hand searches, yielded 2076 unique records after removing duplicates. After the records were screened for eligibility, 26 studies were included in this methodological review. The rationale for excluding certain publications is shown in Figure 1, which displays the PRISMA flow chart that illustrates the review process.

5.1 | Study Characteristics

The main characteristics of the 26 included studies are presented in Table 2. As shown in the table, the use of secondary analysis in nursing and midwifery studies employing MMR designs has emerged as a recent development, predominantly in English-speaking countries. The publication years of the

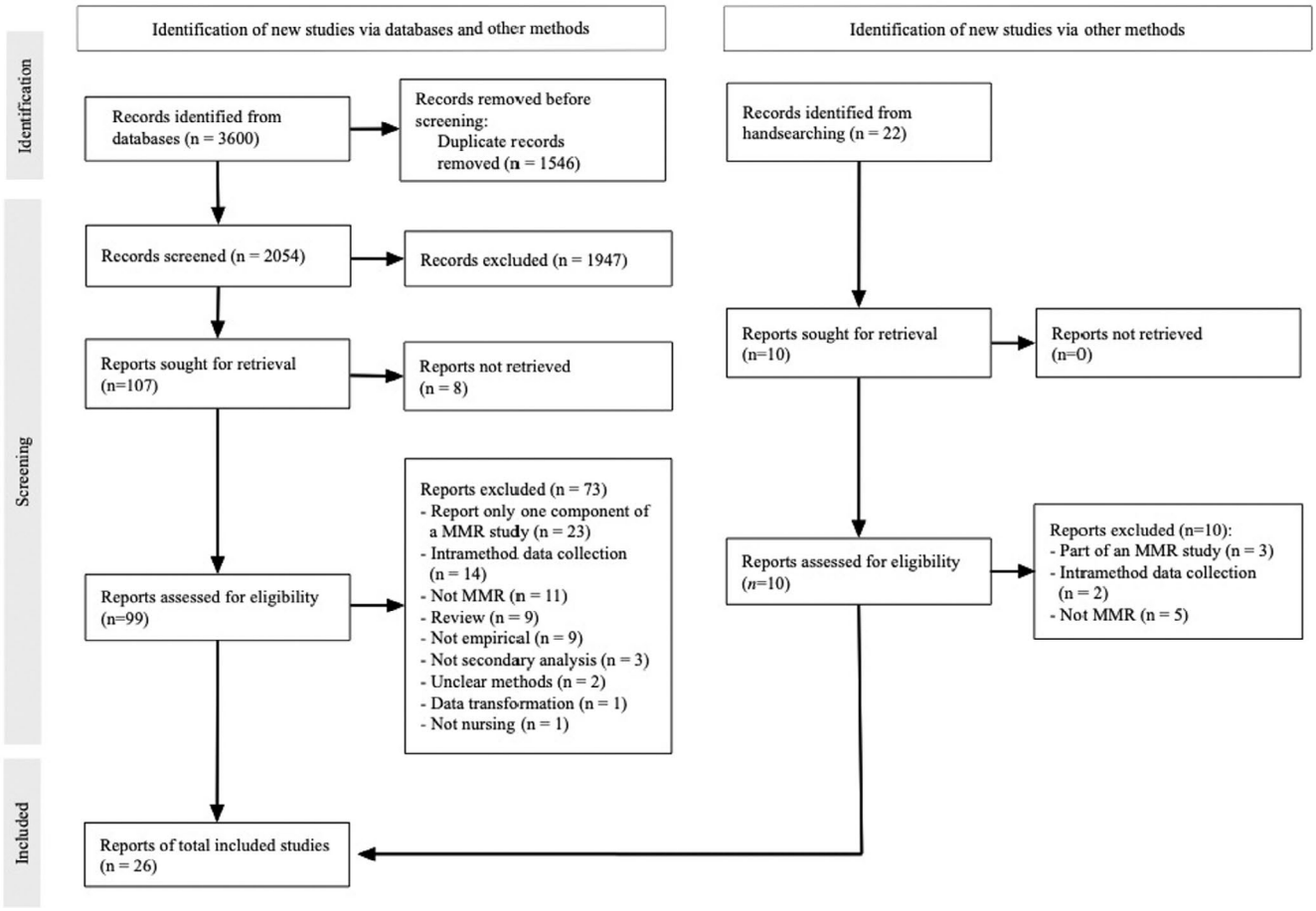

FIGURE 1 | PRISMA Flowchart. MMR = mixed methods research.

included studies ranged from 2000 to 2022, with 19 studies that were published in 2017 or later. Most of the studies were from the United States (Copeland and Harbaugh 2017; Dickson, Buck, and Riegel 2013; Enriquez et al. 2019; Evans et al. 2017; Lim, Baik, and Ashing-Giwa 2012; Marcille, Cudney, and Weinert 2012; Martyn et al. 2013; Powell, Deroche, and Alexander 2021; Powell et al. 2022; Schlenk et al. 2021; Secor-Turner, McMorris, and Scal 2017), followed by two from Australia (Albsoul et al. 2019; Bagot et al. 2020) and Indonesia (Afrizal et al. 2020; Nuriyanto, Rahayuwati, and Lukman 2022) and one each from Belgium (Coolbrandt et al. 2017), Brazil (Spagnolo et al. 2018), Canada (Nemiroff et al. 2019), Denmark (Risom et al. 2019), Germany (Walz et al. 2015), Ghana (Agbozo et al. 2018), Japan (Nakanishi et al. 2021), Lebanon (El-Jardali et al. 2008), Sweden (Lundgren et al. 2022), Switzerland (Grylka-Baeschlin et al. 2020) and the United Kingdom (Marsden 2000). Two studies were published in the journal *Nursing Research* (Dickson, Buck, and Riegel 2013; Martyn et al. 2013), and two others were published in the *Journal of the American Medical Directors Association* (Nemiroff et al. 2019; Powell, Deroche, and Alexander 2021). The remaining studies were published in 22 other journals.

5.2 | Description of Processes and Procedures of Secondary Analyses

5.2.1 | Design and Type of Data Chosen for Secondary Analysis

All the studies included explicitly stated that they conducted a secondary analysis of qualitative and/or quantitative secondary data in one or both components of the MMR study. Eleven studies (Copeland and Harbaugh 2017; Dickson, Buck, and Riegel 2013; Enriquez et al. 2019; Evans et al. 2017; Marcille, Cudney, and Weinert 2012; Martyn et al. 2013; Nakanishi et al. 2021; Nemiroff et al. 2019; Risom et al. 2019; Schlenk et al. 2021; Secor-Turner, McMorris, and Scal 2017) used a combination of qualitative and quantitative secondary data, while another 11 studies (Afrizal et al. 2020; Agbozo et al. 2018; El-Jardali et al. 2008; Grylka-Baeschlin et al. 2020; Lim, Baik, and Ashing-Giwa 2012; Marsden 2000; Nuriyanto, Rahayuwati, and Lukman 2022; Powell, Deroche, and Alexander 2021; Powell et al. 2022; Spagnolo et al. 2018; Walz et al. 2015) relied solely on quantitative secondary data, and four studies (Albsoul et al. 2019; Bagot et al. 2020; Coolbrandt et al. 2017; Lundgren et al. 2022) used only qualitative secondary data.

All the studies clearly stated whether the secondary data came from external records or from a parent study, with the latter being more common. Seven studies (Afrizal et al. 2020; Agbozo et al. 2018; Albsoul et al. 2019; El-Jardali et al. 2008; Grylka-Baeschlin et al. 2020; Marsden 2000; Nuriyanto, Rahayuwati, and Lukman 2022) used quantitative and qualitative data that were not collected as part of a parent study, including sociodemographic data ($n=1$), questionnaires ($n=1$), cohort registries ($n=1$), medical/administrative records ($n=4$) and telephone records ($n=1$) from healthcare organisations and associations. In the remaining 19 studies, secondary data were obtained from a parent study or studies, including questionnaires and surveys ($n=14$), medical records ($n=2$) and physical activity data ($n=1$) in the quantitative component, and interviews ($n=7$), open-ended questions ($n=2$), social network data ($n=1$), focus groups ($n=1$), field notes ($n=1$) and various types of transcripts ($n=4$), such as telephone logs, computer exchanges, notes and a debriefing session, in the qualitative component.

5.2.2 | Linkage to the Parent Study

The majority of the included studies that obtained secondary data from parent studies clearly indicated the link to those studies. Fourteen of these studies (Bagot et al. 2020; Coolbrandt et al. 2017; Dickson, Buck, and Riegel 2013; Enriquez et al. 2019; Evans et al. 2017; Lim, Baik, and Ashing-Giwa 2012; Lundgren et al. 2022; Marcille, Cudney, and Weinert 2012; Powell, Deroche, and Alexander 2021; Risom et al. 2019; Schlenk et al. 2021; Secor-Turner, McMorris, and Scal 2017; Spagnolo et al. 2018; Walz et al. 2015) explicitly provided a full citation of the study or studies, four (Copeland and Harbaugh 2017; Martyn et al. 2013; Nakanishi et al. 2021; Powell et al. 2022) referred to a parent study but did not provide a source that was sufficiently clear to identify it, and one (Nemiroff et al. 2019) cited a protocol. In almost all of the studies for which the source could be identified, it was clear that the researchers had been involved in the parent study, either because they explicitly stated their participation in the study or because they had self-cited their previous studies. This information was not clearly reported in only one study (Walz et al. 2015).

5.2.3 | Ethical Considerations

Ethical considerations in the included studies were mostly described in general terms, and only a few reported ethical issues specific to secondary analysis. All but three studies (Enriquez et al. 2019; Marsden 2000; Walz et al. 2015) cited the Institutional Review Board (IRB) clearance for the ethical protocol, and only two of these specifically mentioned the clearance for the secondary analysis process (both used external records as a source for secondary analysis). Specifically, Grylka-Baeschlin et al. (2020) received IRB approval to use both quantitative secondary data and qualitative primary data for their research, whereas Albsoul et al. (2019) received permission to release secondary data under the Public Health Act. Six studies referenced ethical procedures prior to secondary analysis, including de-identification of computer exchange transcripts, medical and hospital records (Albsoul et al. 2019; Marcille, Cudney, and Weinert 2012), omission of patient names in telephone records (Marsden 2000), acquisition of permission to use anonymised routine data (Grylka-Baeschlin et al. 2020) and ethical agreements for researchers and data analysts (Martyn et al. 2013; Walz et al. 2015).

5.2.4 | Rigour and Methodological Limitations in Secondary Analyses

Most of the included studies did not mention strategies to ensure rigour in conducting secondary analysis and they gave greater attention to the potential limitations associated with

TABLE 2 | Characteristics of the included studies in the review ($n = 26$).

Study (year)[a]	Country	Type of design	Component with SA	QUAN data source	QUAL data source	Source of SA	Integration	MMR insights[b]
Afrizal et al. (2020)	Indonesia	Explanatory sequential	QUAN	Cohort register (S)	Interviews (P)	Records	Connecting	Not reported
Agbozo et al. (2018)	Ghana	Explanatory sequential	QUAN	Medical records (S), questionnaire (P)	Open-ended questions (P), Interviews (P)	Records	Merging (joint display), building	QUAL provides better understanding of QUAN
Albsoul et al. (2019)	Australia	Convergent	QUAL	Questionnaire (P)	Electronic health records (S), administrative health data (S)	Records	Not reported	Not reported
Bagot et al. (2020)	Australia	Explanatory sequential[c]	QUAL	Questionnaire (P)	Open-ended questions (P), Interviews (S)	Study	Not reported	Not reported
Coolbrandt et al. (2017)	Belgium	Convergent	QUAL	Questionnaire (P)	Open-ended questions (P), Interviews (S)	Study	Merging	QUAL provides better understanding of QUAN
Copeland and Harbaugh (2017)	USA	Convergent	QUAN, QUAL	Questionnaire (S)	Interviews (S)	Study	Merging (joint display)	QUAL provides better understanding of QUAN
Dickson, Buck, and Riegel (2013)	USA	Convergent[c]	QUAN, QUAL	Questionnaire (S)	Interviews (S)	Study	Merging	QUAL provides better understanding of QUAN, ascertain validity of QUAN
El-Jardali et al. (2008)	Lebanon	Convergent[c]	QUAN	Sociodemographic data (S), Questionnaire (P)	Open-ended questions (P), Interviews (P)	Records	Not reported	Not reported
Enriquez et al. (2019)	USA	Convergent	QUAN, QUAL	Questionnaire (S)	Field notes (S)	Study	Merging (joint display)	Ascertain validity of QUAN
Evans et al. (2017)	USA	Convergent[c]	QUAN, QUAL	Questionnaire (S)	Notes of phone logs (S)	Study	Not reported	Not reported

(Continues)

TABLE 2 | (Continued)

Study (year)[a]	Country	Type of design	Component with SA	QUAN data source	QUAL data source	Source of SA	Integration	MMR insights[b]
Grylka-Baeschlin et al. (2020)	Switzerland	Explanatory sequential[c]	QUAN	Electronic health records (S), administrative health data (S)	Interviews (P), focus groups (P)	Records	Connecting	Not reported
Lim, Baik, and Ashing-Giwa (2012)	USA	Convergent	QUAN	Questionnaire (S)	Focus groups (P)	Study	Merging	QUAL provides better understanding of QUAN, ascertain validity of QUAN
Lundgren et al. (2022)	Sweden	Convergent[c]	QUAL	Questionnaire (P)	Focus groups (S)	Study	Merging	QUAL provides better understanding of QUAN, ascertain validity of QUAN
Marcille, Cudney, and Weinert (2012)	USA	Convergent[c]	QUAN, QUAL	Questionnaire (S)	Transcripts of computer exchanges (S)	Study	Not reported	Not reported
Marsden (2000)	UK	Convergent[c]	QUAN	Telephone triage sheets (S), Hospital records (S)	Interviews (P)	Records	Merging	QUAL provides better understanding of QUAN
Martyn et al. (2013)	USA	Explanatory sequential	QUAN, QUAL	Questionnaire (S)	Open-ended questions (S), interviews (S)	Study	Merging, building	QUAL provides better understanding of QUAN, ascertain validity of QUAN
Nakanishi et al. (2021)	Japan	Convergent[c]	QUAN, QUAL	Questionnaire (S)	Transcript of debriefing meeting (S)	Study	Not reported	Not reported
Nemiroff et al. (2019)	Canada	Convergent[c]	QUAN, QUAL	Medical records (S)	Transcripts of notes (S)	Study	Merging	Answer QUAN and QUAL questions
Nuriyanto, Rahayuwati, and Lukman (2022)	Indonesia	Explanatory sequential	QUAN	Questionnaire (S)	Interviews (P)	Records	Building	Not reported

(Continues)

TABLE 2 | (Continued)

Study (year)[a]	Country	Type of design	Component with SA	QUAN data source	QUAL data source	Source of SA	Integration	MMR insights[b]
Powell, Deroche, and Alexander (2021)	USA	Explanatory sequential[c]	QUAN	Questionnaire (S)	Interviews (P)	Study	Merging (joint display), connecting, building	QUAL provides better understanding of QUAN
Powell et al. (2022)	USA	Explanatory sequential[c]	QUAN	Questionnaire (S)	Interviews (P)	Study	Merging, connecting	QUAL provides better understanding of QUAN
Risom et al. (2019)	Denmark	Explanatory sequential	QUAN, QUAL	Questionnaire (S)	Interviews (S)	Study	Merging (joint display), connecting	QUAL provides better understanding of QUAN, ascertain validity of QUAN
Schlenk et al. (2021)	USA	Convergent[c]	QUAN, QUAL	Physical activity data (S), questionnaire (S)	Open-ended questions (S), Social network data (S)	Study	Merging	Answer QUAN and QUAL questions; ascertain validity of QUAN
Secor-Turner, McMorris, and Scal (2017)	USA	Exploratory sequential	QUAN, QUAL	Questionnaire (S)	Interviews (S)	Study	Merging	Expand QUAL
Spagnolo et al. (2018)	Brazil	Explanatory sequential	QUAN	Questionnaire (S)	Interviews (P)	Study	Merging, connecting	Ascertain validity of QUAN
Walz et al. (2015)	Germany	Convergent	QUAN	Medical records (S)	Interviews (P)	Study	Merging	Answer QUAN and QUAL questions; ascertain validity of QUAN

Abbreviations: (P) = primary data, (S) = secondary data, MMR = mixed methods research, QUAL = qualitative, QUAN = quantitative, SA = secondary analysis.
[a]Studies are presented in alphabetical order.
[b]MMR Insights are indicated only when the evidence of integration was generated by merging.
[c]The type of design had to be inferred because it was not explicitly reported, or if it was, it was mislabeled.

using this approach. Among the 26 studies included in the review, only Walz et al. (2015) mentioned the use of specific rigour strategies for secondary analysis by stating that they followed their country's protocols for such analysis. Sixteen studies provided a clear description of limitations specific to secondary data analysis. Limitations reported in these studies included the incompleteness of data in registries and medical records (Agbozo et al. 2018; Albsoul et al. 2019; El-Jardali et al. 2008; Grylka-Baeschlin et al. 2020), the age of the data (Bagot et al. 2020), the lack of reliability of the data (Enriquez et al. 2019) and the inability to follow up with participants for clarification (Evans et al. 2017). In addition, several studies reported limitations related to the fact that they addressed an objective that was different from that of the parent study. These limitations included a lack of sufficient data and information on the topic studied, an inability to analyse topics other than those covered by the data and a failure to obtain responses from all participants on that topic (Bagot et al. 2020; Coolbrandt et al. 2017; Dickson, Buck, and Riegel 2013; Marcille, Cudney, and Weinert 2012; Nemiroff et al. 2019; Powell, Deroche, and Alexander 2021; Powell et al. 2022; Risom et al. 2019; Spagnolo et al. 2018; Walz et al. 2015). Not a single study explicitly addressed the limitations associated with conducting secondary analyses in the context of an MMR study.

5.2.5 | Description of Quantitative and Qualitative Secondary Methods

All the included studies provided a detailed description of the type of secondary analysis performed, as well as the methodology used in the parent study with respect to sampling and data collection for both quantitative and qualitative secondary data. The authors clearly indicated whether the data included the entire data set of the original study or only a portion of it. In addition, the secondary data analysis strategy was thoroughly described in all studies. The quantitative secondary analysis strategies used in most cases included descriptive statistics, chi-square tests and other bivariate tests, although a few studies also used ANOVAs, logistic regressions, structural equations, path analysis and linear mixed models. Qualitative secondary data were analysed primarily using content analysis, with a smaller number of studies using other strategies such as thematic analysis, grounded theory approaches, within and cross case analysis, and the framework method. None of the studies described the analysis strategy used in the parent studies, making it impossible to determine whether this strategy was different and how it may have differed. Finally, five (Agbozo et al. 2018; Albsoul et al. 2019; El-Jardali et al. 2008; Grylka-Baeschlin et al. 2020; Marsden 2000) of the seven studies that obtained data from external sources rather than from a parent study provided detailed information about how the researchers accessed the data.

5.3 | Mixed Methods Features and Integration Procedures

The majority of the included studies self-identified themselves as MMR, and half cited literature on this approach, although this was not MMR literature specific to nursing. Twenty-three studies used the term 'mixed methods' to refer to the methodological approach employed, whereas only three (El-Jardali et al. 2008; Marcille, Cudney, and Weinert 2012; Nakanishi et al. 2021) reported employing a combination of secondary analyses of quantitative and qualitative data and therefore did not mention the term. Consistent with our inclusion criteria, regardless of the terminology used to describe their methodology, the authors in all 26 studies collected (or used previously collected) quantitative and qualitative data and analysed them using quantitative and qualitative analysis strategies. Among those that used the term 'mixed methods', 13 studies (Agbozo et al. 2018; Albsoul et al. 2019; Coolbrandt et al. 2017; Copeland and Harbaugh 2017; Dickson, Buck, and Riegel 2013; Enriquez et al. 2019; Evans et al. 2017; Lim, Baik, and Ashing-Giwa 2012; Lundgren et al. 2022; Powell et al. 2022; Risom et al. 2019; Secor-Turner, McMorris, and Scal 2017; Walz et al. 2015) cited works from the MMR methodological literature to justify their decision to use MMR and the procedures they followed. The most frequently cited sources were several books and book chapters by Creswell and colleagues, followed by two references to the book by Morse and Niehaus (2009) and one citation each to articles by Bryman (2006), Fetters, Curry, and Creswell (2013), Williamson (2005), Morgan (1998), and Östlund et al. (2011). Notably, only Williamson (2005) and Östlund et al. (2011) were specific to the field of health care and nursing, while the rest of the cited literature had a more general disciplinary focus.

The MMR design was adequately explained in only half of the studies. 13 studies (Afrizal et al. 2020; Agbozo et al. 2018; Albsoul et al. 2019; Coolbrandt et al. 2017; Copeland and Harbaugh 2017; Enriquez et al. 2019; Lim, Baik, and Ashing-Giwa 2012; Martyn et al. 2013; Nuriyanto, Rahayuwati, and Lukman 2022; Risom et al. 2019; Secor-Turner, McMorris, and Scal 2017; Spagnolo et al. 2018; Walz et al. 2015) explicitly mentioned the type of design used, while in the remaining 13 (Bagot et al. 2020; Dickson, Buck, and Riegel 2013; El-Jardali et al. 2008; Evans et al. 2017; Grylka-Baeschlin et al. 2020; Lundgren et al. 2022; Marcille, Cudney, and Weinert 2012; Marsden 2000; Nakanishi et al. 2021; Nemiroff et al. 2019; Powell, Deroche, and Alexander 2021; Powell et al. 2022; Schlenk et al. 2021), the design had to be inferred. All the studies that explicitly mentioned the design also used the term 'mixed methods' to describe their methodology, and of these, nine (Agbozo et al. 2018; Albsoul et al. 2019; Coolbrandt et al. 2017; Copeland and Harbaugh 2017; Enriquez et al. 2019; Lim, Baik, and Ashing-Giwa 2012; Risom et al. 2019; Secor-Turner, McMorris, and Scal 2017; Walz et al. 2015) cited MMR methodological literature. The most commonly used design was convergent ($n = 15$), followed by explanatory sequential ($n = 10$) and exploratory sequential ($n = 1$) designs. In both convergent and sequential designs, the authors used secondary data sources in only one component in some studies and in both components in others.

In the majority of the studies, the reasons for the use of MMR were explained. 17 studies (Agbozo et al. 2018; Albsoul et al. 2019; Bagot et al. 2020; Coolbrandt et al. 2017; Copeland and Harbaugh 2017; Dickson, Buck, and Riegel 2013; El-Jardali et al. 2008; Enriquez et al. 2019; Evans et al. 2017; Lim, Baik,

and Ashing-Giwa 2012; Marcille, Cudney, and Weinert 2012; Martyn et al. 2013; Nuriyanto, Rahayuwati, and Lukman 2022; Powell, Deroche, and Alexander 2021; Powell et al. 2022; Risom et al. 2019; Secor-Turner, McMorris, and Scal 2017) mentioned an explicit rationale for using an MMR approach. In the remaining nine studies (Afrizal et al. 2020; Grylka-Baeschlin et al. 2020; Lundgren et al. 2022; Marsden 2000; Nakanishi et al. 2021; Nemiroff et al. 2019; Schlenk et al. 2021; Spagnolo et al. 2018; Walz et al. 2015), the rationale was not explicitly stated but could be inferred from the quantitative and qualitative objectives of the study.

Most studies clearly reported the integration strategies used as well as the outcomes that resulted from the integration. Twenty studies showed evidence of integration of the quantitative and qualitative components in either the data collection or interpretation phase or both. In this review, following Fetters (2020), integration is defined as the intentional mixing of the quantitative and qualitative components throughout the research process, with the aim of generating a novel outcome related to the research design (if integration occurs during data collection) or interpretation of findings (if integration occurs during data interpretation) that would not be possible using a quantitative or qualitative approach in isolation. Integration did not exhibit a discernible pattern in terms of the form of secondary analysis employed, as studies that integrated employed a combination of quantitative and qualitative secondary sources or solely one of these forms.

In nine studies, integration was achieved during the data collection phase through the strategies of building (Agbozo et al. 2018; Martyn et al. 2013; Nuriyanto, Rahayuwati, and Lukman 2022), connecting (Afrizal et al. 2020; Grylka-Baeschlin et al. 2020; Powell et al. 2022; Risom et al. 2019; Spagnolo et al. 2018), or a combination of both (Powell, Deroche, and Alexander 2021). Building entailed the use of the outcomes of one component to inform the data collection and/or analysis of the other component, while connecting involved the use of the outcomes of one component to inform the selection of participants for the other component. All of these studies were based on an explanatory sequential MMR design, which utilised both quantitative and qualitative secondary sources, either in combination or as a single source. For instance, employing this type of design, Powell, Deroche, and Alexander (2021) used findings from a secondary data survey on nursing home IT adoption to select participants and develop an interview guide for the second phase of their study.

In 17 studies (Agbozo et al. 2018; Coolbrandt et al. 2017; Copeland and Harbaugh 2017; Dickson, Buck, and Riegel 2013; Enriquez et al. 2019; Lim, Baik, and Ashing-Giwa 2012; Lundgren et al. 2022; Marsden 2000; Martyn et al. 2013; Nemiroff et al. 2019; Powell, Deroche, and Alexander 2021; Powell et al. 2022; Risom et al. 2019; Schlenk et al. 2021; Secor-Turner, McMorris, and Scal 2017; Spagnolo et al. 2018; Walz et al. 2015), integration occurred in the interpretation stage through the strategy of merging, whereby the quantitative and qualitative results are 'put together' to provide an integrated interpretation of the overall study findings and generate new MMR knowledge. Among these 17 studies, five authors (Agbozo et al. 2018; Copeland and Harbaugh 2017; Enriquez et al. 2019; Powell, Deroche, and Alexander 2021; Risom et al. 2019) used different types of joint display tables to merge the quantitative and qualitative data sources. Joint displays enable researchers to integrate quantitative and qualitative data sets in a systematic and transparent manner, thereby facilitating comparison and comprehension (Guetterman, Fàbregues, and Sakakibara 2021). For example, in an explanatory sequential MMR study evaluating a growth monitoring and promotion program for children in Ghana, Agbozo et al. (2018) used a side-by-side joint display to contrast quantitative secondary data findings with qualitative primary data findings across various dimensions of the study topic. Copeland and Harbaugh (2017) used a statistics-by-themes joint display to examine differences in first-time, low-income mothers' responses to qualitative secondary interviews as a function of differences in the levels of maternal competence identified in the quantitative secondary data.

Finally, for the 16 studies that integrated through merging, the insights gained from the use of MMR were determined from the information reported on the justification for the use of MMR in the study and the evidence of integration. Three general types of MMR insights were observed that were not mutually exclusive. First, in 11 studies (Agbozo et al. 2018; Coolbrandt et al. 2017; Copeland and Harbaugh 2017; Dickson, Buck, and Riegel 2013; Lim, Baik, and Ashing-Giwa 2012; Lundgren et al. 2022; Marsden 2000; Martyn et al. 2013; Powell, Deroche, and Alexander 2021; Powell et al. 2022; Risom et al. 2019), qualitative findings were used to better explain the quantitative findings. For example, Coolbrandt et al. (2017) used secondary interview data to explain the findings of primary quantitative survey data on patterns of symptom diary use during chemotherapy treatment and the factors influencing its use. Second, in nine studies (Dickson, Buck, and Riegel 2013; Enriquez et al. 2019; Lim, Baik, and Ashing-Giwa 2012; Lundgren et al. 2022; Martyn et al. 2013; Risom et al. 2019; Schlenk et al. 2021; Spagnolo et al. 2018; Walz et al. 2015), the qualitative findings were contrasted with the quantitative findings to strengthen the validity of the study findings. For example, Risom et al. (2019) compared quantitative secondary outcomes on the impact of a socioeducational intervention on patients' mental health with qualitative findings, also secondary, on patients' experiences and perceived effectiveness of this intervention to 'strengthen methodological rigor' (p. 338). Third, three studies (Nemiroff et al. 2019; Schlenk et al. 2021; Walz et al. 2015) used the quantitative and qualitative components to answer nonoverlapping, complementary questions. For example, Nemiroff et al. (2019) used medical records to quantitatively examine the prevalence of and adherence to 'No transfer to hospital' advance directives among long-term care patients in Canada, and in parallel, they used transcribed notes to qualitatively examine the circumstances under which some patients were transferred to the hospital against their directives. Finally, the study by Secor-Turner, McMorris, and Scal (2017) used the descriptive quantitative findings from a secondary data analysis of a survey on the sexual health experiences of young people with mobility impairments to illustrate and further exemplify the qualitative findings from the secondary analysis of interviews with professionals working with the same populations.

6 | Discussion

This is the first methodological review to examine the use and reporting of secondary analysis in MMR within nursing and midwifery or in any other disciplinary field. The studies identified demonstrate the potential that secondary analysis has to generate sophisticated evidence-based knowledge from existing health databases in a cost-effective manner. Given that MMR is often associated with higher costs and longer timeframes (Watkins 2022), the cost-saving nature of secondary analysis is particularly beneficial. Many of the studies identified were recent, which may indicate a recent upturn in the use of secondary analysis among nurse–midwifery researchers. Most studies were from the United States, which is consistent with the fact that the majority of MMR literature, both in general and in nursing, has generally been published in Anglo-Saxon countries (Beck and Harrison 2016; Creswell and Sinley 2017). In addition, almost half of the studies used secondary data analysis in both components, which contrasts with claims that this type of approach is more likely to be used in only one component, usually the first in an MMR sequential design (Gray and Geraghty 2020; Watkins 2022).

According to Watkins (2022), the use of secondary analysis in MMR presents several unique difficulties that are typically specific to each type of MMR design. For example, the lack of complementary data in convergent studies or the fact that secondary data of one type do not fit well with primary data of the other type in sequential designs. In this review, the fact that in many studies the secondary quantitative and qualitative data were derived from the same parent study allowed the researchers to address some of these problems of nonalignment. In those studies, the data were collected from the same group of participants, ensuring that both the quantitative and qualitative aspects addressed comparable concerns, and thus providing a greater degree of coherence and consistency at the time of the integration of both types of data. However, potential limitations related to the integration of a secondary data source with a primary data source could not be determined because, contrary to the reporting guidelines suggested by Watkins (2022) for studies of this type, none of the reviewed studies reported limitations associated with the use of secondary analysis in an MMR study (i.e., MMR-specific limitations related to integration or to the use of secondary analysis in one or two components).

The studies included presented a few additional reporting issues. Very few studies provided an explicit rationale for the use of secondary data, both in general and specifically for the MMR design. Apart from the assumption that using existing data would have saved researchers considerable time and resources in data collection, it was not clear what the added value of this approach was in any of the studies, or whether secondary analysis was appropriate for adequate integration, which are reporting characteristics recommended by Watkins (2022). In addition, other aspects not reported included specific ethical aspects of the secondary analysis, such as the need to respect the original focus of the parent study while avoiding a poor fit between the secondary questions and the original questions of the parent study. Many studies that used data from previous studies as a source for the secondary analysis mentioned receiving IRB approval for the parent study, but none of these specified obtaining participant consent for the reuse of their data, either at the time of the original study or as a result of recontacting participants during the secondary analysis. This conduct is at variance with the need for participant consent that is discussed in the literature on secondary analysis and data sharing (Brakewood and Poldrack 2013; Long-Sutehall, Sque, and Addington-Hall 2011; Ploug and Holm 2015; Prosser et al. 2023). As seen in the literature, obtaining consent from participants in the original study for data reuse is a critical ethical consideration that is consistent with the principle of respect for persons and typifies a 'reciprocal relationship with participants' (Prosser et al. 2023, 1642). This practice assures participants that they are fully informed and able to decide how their data will be used, including the future reuse of those data and the potential risks of such reuse.

Furthermore, only two studies that used secondary data from records explicitly mentioned IRB approval for such use. In contrast to these reporting issues that we have just enumerated, all the studies included a detailed description of the quantitative and/or qualitative methods used in the parent study, in terms of sampling and data collection. However, while the type of secondary analysis conducted was clear in all studies, in most cases no information was provided on how this analysis differed from that conducted in the parent study, making it difficult in some cases for us to assess the methodological consistency of the secondary analysis accurately.

In terms of specific MMR characteristics, a significant number of studies met the standards for these types of studies, particularly those published more recently. This finding is consistent with the review of MMR in nursing by Irvine et al. (2020), who found that more recent studies were of higher quality in terms of the requirements of MMR. Most studies self-identified as 'mixed methods', and half cited methodological literature on MMR. However, the MMR literature cited was largely generic and not specific to nursing, despite the extensive availability of methodological literature in this area, including works by Andrew and Halcomb (2009), Halcomb and Hickman (2015), Beck and Harrison (2016), Younas, Pedersen, and Tayaben (2019), Irvine et al. (2020), and Thompson and Ivankova (2022), among others. This failure to cite relevant nursing-specific MMR literature may favour an inopportune neglect of nursing-specific aspects of research and may also be an obstacle to realising the potential of MMR to achieve nursing research goals (Fàbregues and Paré 2018).

Almost three-quarters of the studies provided an explicit justification for the use of MMR, a higher percentage than what is shown in published reviews on the use of MMR in nursing (Beck and Harrison 2016; Thompson and Ivankova 2022; Younas, Pedersen, and Tayaben 2019). The types of justifications found in the included studies were consistent with those found in previous reviews, which identified most studies that justified the use of MMR in order to better explain the quantitative findings (Bressan et al. 2017; Irvine et al. 2020) and to provide a broader, more comprehensive understanding of the phenomenon under study (Younas, Pedersen, and Tayaben 2019). Another positive finding was that over three-quarters of the studies showed evidence of integration of both components, by using a joint display in five cases. This number is significantly higher than what was found in most of the previous MMR reviews, where less than half of the

studies integrated quantitative and qualitative findings (Beck and Harrison 2016; Irvine et al. 2020), except for Younas, Pedersen, and Tayaben (2019), who obtained results similar to our findings. The findings with respect to integration found in our review are particularly relevant, given the difficulties to integrate in MMR studies based on secondary data across design types, as reported by Watkins (2022). In contrast to these positive aspects concerning reporting, the MMR design was not explicitly mentioned in half of the studies, a finding that contrasts with the reviews by Younas, Pedersen, and Tayaben (2019) and Irvine et al. (2020), where this feature was transparently described in detail. Another aspect that was ignored in the included studies was the quality dimension of MMR, as none of these studies mentioned that specific MMR quality criteria were used, a trend that was also observed in the review by Thompson and Ivankova (2022).

6.1 | Recommendations

Table 3 shows seven recommendations for improving reporting of MMR secondary analysis studies. These recommendations were developed through an iterative process of consensus-building through several meetings among the authors to interpret the findings and identify reporting issues in the reviewed studies. Prior to this work, the authors had collaborated on several MMR studies, which facilitated understanding and consensus. Following these recommendations will enable nurse–midwifery researchers to communicate the potential of this methodological approach effectively to readers.

TABLE 3 | Recommendations for the reporting of MMR Nursing and Midwifery Studies using secondary analysis.

- Provide a rationale for the use of one or two secondary data sources in an MMR study.
- Describe the MMR design used, indicating the purpose of each component and the overall MMR purpose, the interaction of the primary/secondary data sources throughout the study, and the points of integration between them.
- Describe the original source and procedures used to collect the data to be analysed secondarily, indicating the differences between the research questions of the secondary study and those of the parent study.
- Describe the analysis conducted with the secondary data and explain how it differs from the analysis of the parent study.
- Describe the procedures used to integrate the primary/secondary quantitative and qualitative data sources and provide evidence of this integration in narrative form and/or (preferably) through a joint display.
- Describe any ethical procedures followed in the use and handling of secondary data, including IRB approval for secondary analysis.
- Describe any limitations resulting from the use of secondary data sources, including whether the use of secondary data compromised the MMR integration of the two data sources.

Abbreviation: MMR = mixed methods research.

6.2 | Limitations

Most of the studies reviewed were from the United States; therefore, the results may not accurately reflect the prevalence of the use of secondary analysis in different contexts or the ways in which secondary analyses are performed. We included only studies published in English, which may have resulted in missing some studies published in other languages. We did not critically appraise the studies included in the review; updated reviews in the future might profitably include such an appraisal. Lastly, in accordance with some definitions of MMR in the literature (Creswell and Plano Clark 2018; Morse and Niehaus 2009), we excluded studies based on surveys with open-ended and closed-ended questions, as well as studies based on the transformation of one type of data into the other (i.e., *quantitising* or *qualitising*).

7 | Conclusion

This review has provided an overview of the current state of secondary analyses in MMR in nursing and midwifery. While authors widely recognise the potential of MMR to generate evidence-based, context-specific nursing knowledge that can be used by researchers to address complex health issues, the 'additive nature' of MMR (Rao and Shiyanbola 2022) represents a significant challenge in terms of the time and resources required. In many cases, secondary data analysis could be an optimal solution to help overcome this limitation, especially since this approach helps researchers save time and focus intensely on analysing and interpreting data, free from the distraction of other issues such as logistical difficulties.

However, despite the benefits of making use of secondary analysis, as shown by the results of this review, the number of MMR studies in nursing and midwifery that include secondary analysis is still small. This could be because secondary data analysis is an approach that still receives little attention in MMR literature, and no recommendations are available on how to conduct and report this approach in the context of MMR studies. In this review, we were able to show that the use of secondary analysis within an MMR framework in the included studies facilitated a more complete and robust examination of the phenomenon under study, either by broadening the understanding of one type of finding through the findings of the other type, or else by providing corroborated quantitative and qualitative findings related to the phenomenon under study. In many cases, the studies exhibited a fair level of methodological and reporting quality regarding MMR features, and they provided evidence of the ways in which the two components were integrated, which added value to the results of the study. However, a significant shortcoming of the studies included in our review was that, in general, the features specific to secondary analysis were not fully reported, in particular, the rationale for using a secondary analysis approach, the ways in which ethical issues specific to secondary analysis were addressed, and the limitations associated with using secondary analysis within the framework of an MMR study.

For this reason, we offer a number of recommendations for reporting MMR studies using secondary analysis. Future research should assess the relevance of these recommendations and refine them. In addition, our recommendations could be expanded by more precisely tailoring each recommendation to each type of MMR design. The way in which secondary analysis is incorporated into an MMR study is likely to be contingent upon the particular MMR design implemented, and this factor should be taken into account in future revisions of these recommendations. We believe that taking steps to improve the quality of reporting of MMR studies using secondary analysis could enable researchers to not only communicate the MMR process and results with greater clarity but also to demonstrate how the full potential of secondary analysis was fully exploited in the design and conduct of the MMR study.

Author Contributions

S.F., A.Y., S.I., E.L.E.-B. and A.D. made substantial contributions to conception and design, or acquisition of data or analysis and interpretation of data, involved in drafting the manuscript or revising it critically for important intellectual content, given final approval of the version to be published. Each author should have participated sufficiently in the work to take public responsibility for appropriate portions of the content and agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

Data sharing not applicable to this article as no datasets were generated or analysed during the current study.

Peer Review

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Supporting Information

Additional supporting information can be found online in the Supporting Information section.