

**EFFECTS OF RACE AND MIGRATION ON OBSTETRIC ANAL SPHINCTER
INJURY**

**ELUCIDATING THE INTERSECTIONAL EFFECTS OF RACE AND MIGRATION ON
OBSTETRIC ANAL SPHINCTER INJURY**

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A Thesis Submitted to the School of Graduate Studies in Partial Fulfilment of the
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Descriptive Note

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Lay Abstract

Obstetric anal sphincter injury (OASI) refers to a severe injury to the perineum and perianal muscles following birth, that can have devastating effects on one's well-being. Understanding the differential burden of obstetric trauma in specific racial/ethnic groups is of global health importance.

I conducted a scoping review to assess the existing literature on race/ethnicity, migration, and OASI. The following were examined in the study: race/ethnicity as a risk factor, causal mechanisms behind race/ethnicity as a risk factor (perineal length, obesity and BMI, and language barrier) and migration as a risk factor. A prominent knowledge gap was also found: despite several studies reporting increased risk of OASI in Asian populations, an updated review on the topic has not been published since 2012.

Thus, a systematic review and meta-analysis of studies in high-income, non-Asian countries was conducted to further evaluate this relationship. The meta-analysis found a 1.6-fold increase in OASI among Asian vs. white individuals (OR 1.64, 95% CI 1.48–1.80). Few studies have explored underlying causal mechanisms responsible for this relationship.

The study findings in this thesis can be beneficial in the development of equitable research, policy and clinical implications.

Abstract

Obstetric anal sphincter injury (OASI) describes severe injury to the perineum and perianal muscles following birth. OASI occurs in 4% to 6.6% of vaginal births in Canada and in approximately 4.4% of vaginal births in the United States (US). However, racial and ethnic inequities in the incidence of OASI have been demonstrated in several high-income countries.

The scoping review aimed to assess the literature on the topics of race/ethnicity, migration status, and OASI. The study examined race/ethnicity and migration as risk factors. Causal mechanisms behind race/ethnicity as a risk factor (i.e., perineal length, obesity and Body Mass Index (BMI), and language barrier) were also examined. The study revealed that Asian individuals experience the greatest risk of OASI. Despite this, an updated review on the topic has not been published since 2012.

This led me to the second aim of my thesis, which was to conduct a systematic review and meta-analysis to critically summarize the reported incidence of OASI in Asian subgroups, specifically. I identified 27 studies that compared OASI risk of individuals who identify as Asian vs. white. The meta-analysis pooled estimates of OASI from these studies found a 1.6-fold increase in OASI among Asian vs. white individuals (OR 1.64, 95% CI 1.48–1.80). Few studies have explored underlying causal mechanisms responsible for this relationship.

This thesis is a valuable addition to the existing scholarship in both women's health and health equity research. The exploration of core concepts surrounding the topics of race/ethnicity, migration and OASI provide this thesis with a comprehensive understanding of the studies included. The scoping review provides a clear understanding of the state of the currently available literature within the topics of race/ethnicity, migration and OASI. In addition, the

systematic review and meta-analysis offers a quantitatively comprehensive understanding of Asian race/ethnicity as a risk factor of OASI.

These findings can be used to guide future research in the fields of women's health and health equity. It will also be a valuable guide when developing future health policy and clinical guidelines that prioritize equitable accessibility and availability within obstetric care.

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List of Abbreviations and Symbols

OASI: Obstetric Anal Sphincter Injuries

SOGC: The Society for Obstetricians and Gynecologists of Canada

OECD: Organization for Economic Co-operation and Development

BIPOC: Black, Indigenous, people of colour

OR: Odds Ratio

Adjusted OR: Adjusted Odds Ratio

RR: Risk Ratio

Adjusted RR: Adjusted Risk Ratio

CI: Confidence Interval

BMI: Body Mass Index

BW: Birth weight

Declaration of Academic Achievement

The following is a declaration that the content of the research in this document has been completed by Meejin Park, recognizing the valuable support of her thesis supervisor Dr. Giulia Muraca and supervisory committee members.

Chapter 1

Introduction

1.1 Foundational Concepts and Theoretical Framework

The Constitution of the World Health Organization states that “the enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being without distinction of race, religion, political belief, economic or social condition” (1). This human rights approach to health extends to one’s right to access ante- and post-partum healthcare with dignity and guaranteed safety. Guided by this understanding, this thesis focuses on exploring the intersection of migration status and racism on obstetric anal sphincter injuries.

1.1.1 Racism in Medicine and Obstetric Racism

Racism and racial stereotyping have played a detrimental role in medicine and everyday clinical practice since the inception of biomedicine, resulting in quality of life-impairing outcomes and excess morbidity and mortality amongst BIPOC (Black, Indigenous, people of colour) individuals (2). Racism in medicine represents a pressing global public health challenge, the impacts of which can be experienced at the individual, institutional and structural levels (3).

Obstetric violence is gender-based and encompasses institutional violence as well as violence against individuals who give birth (4). Individuals may encounter obstetric violence through various means, including physical and sexual abuse during delivery, stigma and discrimination based on individuals’ socioeconomic status, as well as inadequate support and communication between practitioner and birthing individuals (5). Medical racism refers to the way a patient’s race impacts the course of one’s medical treatment through mechanisms such as

medical professionals' misconceptions as well as reduced access and quality of healthcare (4).

It is the intersection of obstetric violence and medical racism that leads to obstetric racism, a term coined by anthropologist Dana-Ain Davis. Obstetric racism manifests in the form of stigma and lack of access to quality care (4). According to Davis, obstetric racism is “enacted on racialized bodies that have historically experienced subjugation, especially, but not solely, reproductive subjugation” (53, p.1). Obstetric racism has led to excessive maternal and infant mortality among BIPOC individuals (7). The MBRRACE report, which was conducted in the UK between the years 2019-2023, reported that Black and Asian individuals were at highest risk of dying in pregnancy (8).

As a result of prejudice based on race/ethnicity or culture, diverse populations often experience a decreased quality of maternity care as well. Vedam et al. (9) examined childbirth in the US, and reported that 17.3% of the participants experienced varied forms of mistreatment as well as obstetric violence. This included being shouted at, being ignored, and experiencing violations of physical privacy (9). The study also found that Indigenous, Hispanic, and Black individuals were most likely to report mistreatment (9).

It is also important to note that many existing surgical obstetric techniques, such as caesarean section surgeries and vesicovaginal fistula repair, were forcefully developed on enslaved Black individuals (7,10). These historically violent acts of abuse led to the justification and reinforcement of the harmful stereotypes of Black individuals having a higher pain tolerance (10). These stereotypes have contributed to the disparities in access to epidural analgesia or post-partum opioid prescriptions for Black individuals, even when pain levels and medical needs are controlled for (10). In contrast to the stereotypes faced by Black individuals, stereotypes that

Asian individuals have a lower pain tolerance have been reported (11,12).

The frequently used vaginal birth after caesarean delivery (VBAC) calculator also exemplifies this systemic issue. The VBAC calculator considers race and ethnicity when calculating the likelihood a pregnant individual may experience VBAC (10,13). The calculation fails to consider socioeconomic status, and it oversimplifies the role of race/ethnicity without considering its broader social implications related to access to health care (13). This contributes to the misconception that race is a biological variable and that it is the BIPOC individuals' anatomy that is to be blamed (13). These limitations may further exacerbate racial disparities and oversimplify the complex factors that contribute to VBAC success rates.

It is clear that harmful stereotypes that perpetuate the belief that race is genetic has been maintained by scientific and societal discourses, continuing the exclusion and marginalization of certain racial and ethnic groups.

1.1.2 Intersectional Feminism

An anti-racist, intersectional feminist framework has been applied to guide this thesis. Using this theoretical framework enabled the thesis to acknowledge the interconnected and complex nature of identities in shaping obstetric health outcomes. At its core, feminism posits that radical change should be sought out to establish equality no matter the gender of the person (14). Thus using a feminist lens enables a more critical analysis of the ways different social, economic, and political structures lead to the oppression of humans (15).

In addition, for decades, public health scholars and feminists of colour have been advocating for the examination of “multiple forms of intersecting systems of oppression in health

disparities research” (58, p.239). People of colour often face marginalization as their identities lie at an intersection – their identities and experiences are shaped by their gender, their racial backgrounds as well as other social determinants of health such as economic status and able-bodiedness (17). This is why legal scholar Kimberlé Crenshaw introduced intersectionality as an analytic framework to articulate the unavoidable interaction of racism and patriarchy, as well as “the location of women of color both within overlapping systems of subordination and at the margins of feminism and anti-racism” (37, p.1243).

Various sociopolitical inequities result in a multi-dimensional outcomes of racial/ethnic disparities (16,18). A study by Juan et al. (18) reported, with empirical evidence, that study participants who identified as women of colour perceived that there was a link between ethnicity and gender which has shaped their lived experiences, while those who identified as white were less likely to possess this understanding. The study concluded that women of colour experience race/ethnicity as well as gender in a way that is completely unique to that of white women’s experiences (18). Dating as far back as 1892, it was documented by sociologist and activist Anna Julia Cooper that “the colored woman of to-day occupies, one may say, a unique position in this country...She is confronted by both a woman question and a race problem, and is as yet an unknown or an unacknowledged factor in both” (60, p.387). This quote signifies that non-white individuals’ experiences are distinctly unique from the experiences of those who identify as white, as the combination of social inequities and structural forces result in multi-dimensional outcomes of racial/ethnic disparities (16,18).

Similar rationale has been expressed in the Combahee River Collective statement, a written statement by a collective of Black feminists regarding their anti-racist and anti-sexist position (20). The statement highlights interlocking systems of racial, sexual, heterosexual, and

class oppression that are maintained and reproduced by the political system, which remains “a system of white male rule” (61, p.1). This inhibits fair distribution of resources as well as power to marginalized populations (20).

The additive approach to understanding identity assumes each identity to be independent of other forms of identity, and has a summative impact (21). Contrastingly, an intersectional framework posits that it is the accumulative effects of intertwined identities that create unique life experiences (18). The understanding of intersectionality allows studies to highlight the unique disparities one may experience as a result of intersecting structural determinants such as racism, ableism, homophobia that lead to significant power differences (16,18).

Thus, the anti-racist, intersectional feminist framework guided the framing and analysis of the research findings included in this thesis. This approach enabled a broader understanding that goes beyond simplifying individuals' experiences to a single axis, such as gender or race/ethnicity. Instead, the included analyses focused on understanding the interconnected nature of multiple social identities; all of which contribute to barriers, opportunities, and/or power imbalances (22).

In addition, many existing medical and quantitative studies fail to provide a comprehensive and holistic understanding of the ways race/ethnicity shape one's health outcomes. I have aimed for this thesis to fill this gap, while exploring the ways migration and race/ethnicity intersect and interact to shape individuals' experiences with OASI risk.

1.1.3 Race, Ethnicity, and Ancestry: Misconceptions and Definitions

Due to the absence of standard definitions, a lack of clarity and explanation of their use in health research and other disciplines, the commonly-used variables ‘race,’ ‘ethnicity’ and ‘ancestry’ are often misused and inconsistent (23–27). A systematic review conducted by Ali-Khan et al. (28) noted that none of the studies included in their review provided definitions or justifications for these terms. The authors noted that this lack of clarity can have “powerful ramifications on the domain of science” (27, p.48) as misusing these terms can misconstrue or obscure the role that racism has influenced and continues to shape health outcomes. This sentiment was also echoed by Ghidoui et al. (12, p.818), in which the authors stated that “when researchers use race or ethnicity as a variable without explanation, they imply that race or ethnicity is a ‘natural’ way of grouping humans rather than acknowledging what race and ethnicity actually are — a sociopolitical categorization.”

With the goal of avoiding these pitfalls, this thesis strives to demonstrate a comprehensive and consistent understanding of the appropriate and accurate use of the terms ‘race,’ ‘ethnicity’ and ‘ancestry.’ For centuries, the continuous biological framing of racial differences has reinforced ‘race science’ which refers to the wrongful attribution of biology and genetics to explain differences in human populations (29). It has reinforced the harmful and false understanding that biological and genetic differences are reflected in racial differences in human populations (29). Race science has often been incorporated into medical and scientific research to establish a hierarchical understanding of the human race, “with whiteness at its pinnacle” (28, p.442). Thus, I believe that the complex and intertwined nature of race, ethnicity, and ancestry must be properly understood in both health research and clinical settings.

In this thesis, the term ‘race’ reflects socio-political inequalities, which is often measured and categorized according to physical differences such as skin and eye colour (24,30,31). This is

supported by critical race theory which asserts that social thoughts and relations are behind the conceptual creation of 'race' (32). Race is a social construct that is invented, manipulated, and retired when convenient by the society (32). The harmful socio-political inequalities associated with these categories are maintained by legislation and policies, and reinforced by institutions across society (33). For instance, legal approaches of colorblindness in antidiscrimination statutes protect and re-establish racial hierarchies by invalidating the sociopolitical impacts of race that determine opportunities and access to resources one may have (34,35). These inequalities are reflected in healthcare systems where disparities affect access to basic healthcare services.

Ethnicity is defined by cultural factors including language and nationality (31). Different ethnicities can reflect physical, linguistic, cultural and historical variations, making it a complex and vague concept (24,36). This often leads to research projects establishing unique interpretations of the term, compromising its reliability (24). Ethnicity impacts health through multi-faceted ways; an example of this is the way harmful stereotypes one may experience from their physician based on perceived cultural differences. This can lead to miscommunication and overall unsafe healthcare experiences.

Ancestry is a variable that can be interpreted geographically, genealogically, or genetically (27). Geographic ancestry refers to ancestors from similar geographic regions; genealogical ancestry refers to one's ancestral pedigree; and genetic ancestry refers to the biological ancestors one has descended from (27). Genetic ancestry may successfully describe genetic variants that may impact one's risk for genetic diseases; this is not captured by racial categories in health research (37).

This thesis capitalizes ‘Black’ as it represents a group of people who share similar histories as well as cultural commonalities and shared experiences of discrimination (38). The term ‘African-American’ is not preferred, as the historical legacy of slavery in the US has resulted in most Black individuals not having a specific African ancestry to identify with (39). Thus, in this thesis, I have opted to use the more all-encompassing term ‘Black’ rather than ‘African-American.’ However, when describing any of the studies referenced in this thesis, such as in the data extraction tables, I have retained the original terms as stated in each study, as authors often did not explain their choice of labels or provide definitions.

By contrast, the term ‘white’ is not capitalized as it does not represent a cultural group (17). I wish to acknowledge that there are several stances surrounding this topic and the literature surrounding race/ethnicity is ever-changing and advancing. However, prevailing anti-racism and post-colonial literature has acknowledged that capitalizing ‘white’ is favoured by white supremacist groups and risks conveying that one’s skin colour does not play an integral role in systematic inequalities (17,40). I would equally like to recognize that opinions on the stylizing of these terms may continue to evolve over time but based on my understanding of the literature in its current form I have chosen to take this approach. Several landmark institutions such as the Journal of the American Medical Association, the Washington Post, AP, the Columbia Journalism Review, the Wall Street Journal, The New York Times, USA Today, the Los Angeles Times, NBC News and Chicago Tribune and CBC have chosen to capitalize B in Black. Each of the institutions, with the exception of the Washington Post, have decided to keep the ‘w’ in white lowercased (38,39,41–44). The Journal of the American Medical Association has specified that although it is recommended to capitalize ‘w’ in white, there are instances where it may be perceived as “inflammatory or inappropriate” (43, p.625).

1.1.4 Migration as a Social Determinant of Health

The social determinants of health refer to the interplay between societal, political, and economic determinants of health which work to further influence global patterns of morbidity and mortality (45,46). Approaching health with a social determinants of health lens posits that structural factors shape one's health status at the macrolevel (45). An example of such determinant is migration. The United Nations (UN) International Organization for Migration states that a migrant is "any person who is moving or has moved across an international border or within a State away from his/her habitual place of residence, regardless of the person's legal status; whether the movement is voluntary or involuntary; what the causes for the movement are; or what the length of the stay is" (47).

The decision to migrate presents a significant challenge to one's health as it often "limits behavioral choices and [...] often directly impacts and significantly alters the effects of other social positioning, such as race/ethnicity, gender, or socioeconomic status, because it places individuals in ambiguous and often hostile relationships to the state and its institutions, including health services" (39, p.378).

Migrants face various forms of stigma, marginalization and other mental stressors which can result in further impairments to one's health status (46). The challenges that come with migration are exacerbated for refugees or forced migrants, as they experience increased risk of poverty, inaccessibility to healthcare, and more (46).

Thus, it is equally important to recognize that even within migrant groups, there is a high level of variability as it pertains to health status. This is likely because many migrants excluding those of refugee status are selected based on their high level of education, beneficial work

experience and other “desirable” qualities; this can at times lead to a difference in health status often referred to as the ‘healthy migrant effect’ (46,48). For example, Canada has implemented a rigorous points system to enforce higher selectivity in immigration criteria to satisfy labour market requirements as well as promote long-term economic success (49). In turn, this may provide certain immigrant groups from higher socioeconomic status with a selective protective advantage, however, this effect is not experienced across all those with a migrant background. Most available perinatal studies have not examined whether disparities experienced by foreign-born individuals are associated with race/ethnicity or length of residence (49).

A Canadian study by Wanigaratne et al. (48) examined maternal and perinatal health in Ontario, Canada, and found a non-significant association between refugee status and outcomes, with the exception of HIV due to pre-departure screening. However, other studies have reported higher health morbidities among migrants, particularly when relating to mental health (50). As well, the healthy immigrant effect has been reported to fade over time as immigrants who have lived in the country for more than 10 years were found to have similar rates of health problems as the residents born in the country of immigration (50).

1.1.5 Positionality Statement

As a feminist who is an East Asian immigrant woman, I acknowledge that my positionality may influence my research.

My knowledge and lived experiences may impact my interpretation of the data and the research process. This is because my personal experience as an immigrant woman of colour has provided valuable insights into the experiences faced by individuals in similar circumstances. I have firsthand observed the ways in which power dynamics between healthcare providers and

patients further intensify when a patient belongs to a racial or ethnic minority, especially when they demonstrate language barriers. Additionally, I am familiar with the detrimental impact racial stereotypes can have on personal identity. These are some of the reasons why I felt motivated to examine this thesis topic.

The goal of this thesis is to make a small contribution towards a more equitable ante- and post-partum healthcare system, for marginalized populations. I wanted to ensure that my thesis does not reproduce and perpetuate stereotypes or power dynamics that put blame on marginalized populations for the health disparities they experience.

I am committed to conducting rigorous, accurate and ethical research, and I am dedicated to continue learning and unlearning. I believe that my perspective as an Asian immigrant researcher will be valuable to the field of perinatal health research.

1.2 Clinical Background

1.2.1 Obstetric Trauma

Up to 90% of individuals who have undergone vaginal delivery have been reported to experience obstetric trauma in the US as of 2018 (51). Despite the significant decrease in maternal mortality related to childbirth in high-income countries, rates of maternal morbidity remain a significant concern worldwide (52). Composite outcomes of obstetric trauma consist of: 3rd and 4th degree several perineal lacerations, injury to bladder or urethra, high vaginal laceration, cervical laceration, repair of uterine incision, delayed repair of episiotomy or wound dehiscence, hematoma of the pelvis, injury to the pelvic joints and ligaments, laceration to the broad ligament of the uterus and repair of wound dehiscence after caesarean delivery and other

obstetric injury (53,54). Some of the most significant risk factors for obstetric trauma include first time delivery (nulliparity), forceps and/or vacuum delivery, midline episiotomy, macrosomia, malposition and long duration of the second stage of labour (52,53). Between 2013-2019, the rate of obstetric trauma was reported in 3.45% of 938,664 deliveries reported between 2013-2019 in Canada (55).

A Canadian study published in 2018 by Muraca et al. (54) analyzed 1,938,913 singleton term deliveries in four Canadian provinces between 2004 and 2014, with obstetric trauma being one of the primary outcomes. The study reported a temporal increase in of the obstetric trauma rate in recent years; this pattern was observed especially among nulliparous individuals or those who had previously had a caesarean delivery who underwent operative vaginal deliveries (54). For example, between 2004 and 2014, obstetric trauma rates increased from by 0.6% among nulliparous women (54). Among those who have undergone a previous caesarean delivery, rates of obstetric trauma increased from 2.5% to 3% in the same timeframe (54).

Obstetric trauma contributes to short and long-term life-changing complications. In the long term, women with perineal pain may experience dyspareunia and other changes in sexual experience and decreased self-efficacy giving birth. Perineal pain, for instance, is a distressing short-term complication that can lead to urinary retention and defecation issues (52,56). As well, increases in most pelvic floor disorders including fecal and anal incontinence can lead to significant distress, embarrassment, social isolation and mental health morbidity (57–62). Severe perineal trauma is associated with more negative birth experience and decreased self-efficacy giving birth.

1.2.2 Obstetric Anal Sphincter Injury: Definition, Classification, and Epidemiology

Definition and Classification

Evaluation of the perineal trauma should be performed systematically after all vaginal deliveries. Systematic evaluation may involve a visual inspection, a thorough perineal exam, or a digital rectal examination (51).

There are four main degrees of perineal laceration, and the Sultan classification is a widely accepted tool used to determine the severity of obstetric anal sphincter injuries (51,63). According to the classification, a first degree tear defines injury to perineal skin, while a second degree tear involves injury to the perineum, but not anal sphincter (52). A third degree tear refers to the partial or complete laceration of the anal sphincter complex, which includes the internal and external anal sphincters (52,57). A fourth degree tear involves the laceration to the anal mucosa in addition to the lacerations of a third degree tear (52,57).

Obstetric anal sphincter injury (OASI) refers to the aggregation of third- and fourth-degree perineal lacerations, and represents 71% of obstetric trauma incidents (54). Correspondingly, addressing and reducing the incidence of OASI is crucial for improving healthcare outcomes.

Incidence Globally and Nationally

Within the past 15 years, the rate of OASI in high-income countries such as Canada and Australia have increased by up to 15% (64). The Society for Obstetricians and Gynecologists of Canada (SOGC) reported in 2015 that OASI occurred in 4% to 6.6% of vaginal births in Canada (65). The 1998-2010 Nationwide Inpatient Sample in the US reported a 4.4% incidence rate of OASI among all vaginal births (66).

In 2019, Canada was reported to have the highest incidence rate of OASI among 24 OECD countries (67). The reported crude rate of OASI with instrument was 16.3% vaginal deliveries, and 3.4% without instruments such as vacuum and forceps (67). This is significantly higher than the average crude rate of all 24 OECD countries, which was 5.3% with instruments, and 1.4% without instruments (67).

Clinical Risk Factors of OASI

Clinical Risk factors for OASI include maternal, delivery, and infant characteristics. Some of the maternal risk factors include older age, diabetes, and primiparity. Delivery risk factors include operative vaginal delivery and episiotomy (51,52). Below I describe OVD and episiotomy in relation to OASI in more detail.

Operative Vaginal Delivery (OVD) and OASI

OVD is a risk factor for OASI, making its incidence and trends worthwhile to describe in greater depth. OVD refers to the use of forceps or vacuums to expedite the delivery during the second stage of labour (55). This is performed when there is imminent risk to the fetus or when birthing individuals have been identified with a condition that may benefit from avoiding exertion (55). It is important to note that OVDs are used as an alternate option to caesarean delivery which can be challenging and risks severe maternal and perinatal morbidity (55).

10%-15% of deliveries in Canada, Australia, and the United Kingdom have been reported as OVD (55,68,69). A recent study published in 2022 (55) examined 1,326,191 deliveries in Canada, with the exception of Quebec, to examine obstetric and neonatal trauma such as OASI, high vaginal laceration and brachial plexus injury, as a consequence of operative vaginal

delivery. The cohort included singleton, term ≥ 37 weeks live birth or stillbirth. deliveries to pregnant people without a previous caesarean delivery (55). The study reported obstetric trauma incidence in 25.3% of forceps and 13.2% of vacuum deliveries. The rate of OASI varies between countries. OASI occurred in 2.8% of spontaneous deliveries (55). The frequency of OASI was higher among forceps delivery (21.5%) compared with vacuum delivery (11.7%) (55).

Episiotomy and OASI

OASI can occur spontaneously during vaginal delivery, or secondarily through an episiotomy (51,52). Episiotomy is a surgical incision of the perineum performed to widen vaginal opening for childbirth (70,71). The procedure is performed to assist vaginal deliveries which have been complicated by fetal distress factor or failure to progress (51,72).

There are two common variations to episiotomy: midline and mediolateral (51). A midline episiotomy is also referred to as a median episiotomy, and starts “within 3mm of the midline in the posterior fourchette and extends 0 to 25 degrees downward in the sagittal plane” (12 ,p.2). A mediolateral episiotomy “starts within 3mm of the midline in the posterior fourchette and is directed laterally at an angle of at least 60 degrees from the midline toward the ischial tuberosity” (12, p.2). SOGC clinical practice guideline published in 2015 by Harvey et al. (52) advised that if an episiotomy is deemed necessary, mediolateral should be considered the optimal option, at a cutting angle of around 60 degrees. A midline episiotomy is widely accepted understood to increase risk of OASI, while a mediolateral episiotomy, performed at the time of assisted vaginal delivery, is protective of OASI (52,73).

A recent study (64) examined 2,570,847 deliveries in Canada, excluding Quebec, to analyze episiotomy use among vaginal deliveries and its association with OASI. The type of

episiotomy was unspecified, but more than 90% episiotomies performed in Canada are mediolateral (64).

The study reported a 9.4% and 45.9% rate of episiotomy, among spontaneous vaginal deliveries and operative vaginal deliveries, respectively (64). The study found that among forceps deliveries, a protective association was found between episiotomy and OASI (adjusted RR 0.74, 95% CI 0.71–0.77), with a stronger association in nulliparous women (adjusted RR 0.63, 95% CI 0.61–0.66). After analyzing parous women who have not undergone a previous caesarean delivery, the authors found that episiotomy led to an increased risk of OASI, though its statistical value was not deemed as significant (adjusted RR 1.16, 95% CI 1.00–1.34) (64).

Among those who underwent vacuum deliveries with an episiotomy, the rate of OASI was higher and showed a stronger correlation among parous women who have not undergone caesarean delivery (adjusted RR 1.71, 95% 1.57–1.87) (64). However, episiotomy was associated with lower rates of OASI among nulliparous women who underwent vacuum delivery (adjusted RR 0.88, 95% CI 0.85–0.91) (64).

Short and Long-term Impact of OASI

OASI is an injury that can lead to quality-of-life impairing consequences, both in the short and long term (52). An example of the many immediate complications of the injury is perineal pain (52). Edema and bruising, caused by overly tight sutures to repair perinatal tears, and infection of a dehiscence, have also been reported to be associated with short-term perineal pain (52).

Perineal pain in the immediate postpartum period can cause urinary retention as well as defecation (52). Dyspareunia and difficulty maintaining sexual function are some of the long-term consequences of perineal pain (52). In addition, abscess formation, wound breakdown, and rectovaginal fistulae have been reported as consequences of severe perineal tears (52).

Anal incontinence has been reported to occur in 39% of OASI patients, after the primary repair (52). Anal incontinence is the most disabling of the long-term consequences of OASI (52). This is because anal incontinence includes several symptoms such as flatal incontinence, which is associated with 29-53% of patients who experienced an OASI, and fecal incontinence which has been reported in 5% to 10% of OASI patients (51).

The consequences one may experience from injury depends on the damage of the perineum, the repair process (62). The symptoms of OASI lead to hygienic, social, and psychological consequences; these symptoms are often exacerbated due to stigma and assumption that the symptoms they are facing are 'normal' (51). Thus, OASI can have detrimental emotional impact in addition to physical consequences, which may lead to social isolation and overall negative quality of life (62).

Contributing to the distress post severe perineal trauma is their often-inaccurate recollection of obstetrical procedures. The urgent nature of obstetric care often precludes explicit and detailed informed consent (74). Moreover, postpartum care is limited in scope and is not currently set up to address pelvic floor concerns arising as a direct consequence of mode of delivery (74). Mental health issues in the postpartum period are more common and range from mild depression and anxiety symptoms to post-traumatic stress disorder following a traumatic

childbirth (74). Maternity and post childbirth care that prioritize cultural humility and structural competence is not currently a priority of clinicians and researchers (74).

1.3 Research Objectives

Racial disparities in maternal outcomes are a pressing global issue that requires immediate attention and action, from researchers of various disciplines, healthcare practitioners and advocates. Despite this, the topic remains largely under-studied, especially in Canada (75).

Miao et al. (76) is one of the few Canadian studies that examined racial variations of adverse perinatal outcomes. The population-based retrospective cohort study included an examination of 412,120 study participants, which consisted of 10.1% Black individuals and 89.9% white individuals in Ontario (76). The study findings indicated that Black individuals were at a higher risk of various perinatal outcomes, including but not limited to gestational diabetes mellitus, preeclampsia, spontaneous preterm birth, emergency caesarean section, macrosomia and more (76). The study called for future studies to analyze the underlying mechanisms of these findings and to examine other geographical regions.

It is imperative to understand racial/ethnic disparities in obstetric trauma and to consider these disparities in relation to intersecting factors. Thus, the objectives of this thesis are to:

1. Analyze maternal race/ethnicity and migration status as risk factors of OASI through a scoping review of the literature.
2. Synthesize the extant literature to better estimate the rates of OASI in Asian and white populations in non-Asian, high-income settings and the relative risk of OASI between these two groups through a systematic review and meta-analysis.

1.4 Hypotheses

I hypothesized that migration-specific factors will explain at least part of the association between race/ethnicity and OASI. I further hypothesized that individuals who identify as non-white, especially those who identify as Asian, would experience higher rates of OASI compared with those who identify as white.

1.5 Study Relevance and Justification

Obstetric trauma is an area of increasing global health importance, yet its differential burden on specific racial/ethnic groups remains understudied. This is of particular concern since a secular increase in the rate of OASI has been evidenced in several high-income countries in recent years and the impact of this increase on BIPOC individuals is unknown (54,77–82). For example, Asian Americans in the US have increased in population size by 70% between 2000 and 2020 (83). Despite this, the health of Asian Americans remains a largely understudied population; only 0.17% of the Institutes of Health (NIH) funding between 1992- 2018 was allocated to the subject (83).

In addition, the COVID-19 pandemic has reaffirmed the need to study racism and racial/ethnic inequities in health outcomes. Differential access to health care among racial and ethnic minority populations impacts the health outcomes of these populations in majority-white countries (84).

This work is relevant to obstetric healthcare globally as a means of enhancing health promotion for marginalized populations. It is expected that these results can be translated to other high-income countries to improve global health outcomes. While pursuing this research,

the Canadian Coalition for Global Health Research (CCGHR) Principles for Global Health

Research (85) will be closely considered. As well, the UN Sustainable Development Goals will

be used to frame any corresponding health-related implications or conclusions (86).

Chapter 2

Race/Ethnicity, Migration and Its Impacts on OASI: A Scoping Review of the Literature

2.1 Background

Maternal mortality rates in high income countries, such as the US and the United Kingdom have raised ongoing concerns due to the existence of disparate rates across various racial groups (87,88). Despite this, individual-level clinical and behavioural factors have not been able to elucidate racial and ethnic inequities across various indicators of maternal well-being.

As discussed previously, migration is an important social determinant of health that can strongly impact one's perinatal health (48). The global estimated number of migrants has increased over the past five decades (89). In 2019, there were 272 million reported international migrants, an increase of 14 million since 2017 (47). Canada, in particular, reported that nearly one quarter of the population consisted of those who identified as immigrants or permanent residents in 2021 (90). This represented the highest number among the G7 countries (90). Additionally, in November 2022, Canada's 2023-2025 Immigration Levels Plan was introduced, which recognized hiring immigrants in key sectors such as technology as a strategy to manage socioeconomic challenges within Canada (91). The plan also included the country's plan to receive 465,000 new permanent residents in 2023, 485,000 in 2024 and 500,000 in 2025 (91).

Thus, understanding the current state of migrant health, as well as its implications for public health interventions and policies, is imperative given that migrants make up a significant portion of the population in countries such as Canada and the US (47,89).

Despite the increasing number of migrants and the temporal increase of OASI rates (54,77–82), there has been no previously published study that reviewed the literature available on maternal race/ethnicity, migration status and OASI in high-income countries. To address this knowledge gap, I conducted a scoping review to assess the extant literature regarding this relationship.

2.2 Methods

This study was conducted and reported in accordance with the Arksey and O'Malley's five-step framework (92) and the PRISMA Extension for Scoping Reviews (93).

Stage 1: Identifying the research question

The following questions guided this scoping review:

- 1) How do race/ethnicity and migrant status impact risk of OASI?
- 2) What are the reported causal mechanisms that may explain this phenomenon?
- 3) What are the identified knowledge gaps in the available literature?

Stage 2: Identifying relevant studies

With the help of an information scientist, MEDLINE, OVID, Embase, Emcare and the Cochrane database were searched using keywords and controlled vocabulary terms related to race/ethnicity, migrant, and OASI (Appendix Table 1). Terms related to religion were also included, as a surrogate for race/ethnicity, in order to find studies that address religious racism, which refers to the intersectional dynamic of racism and discrimination based on religiosity (94).

No restrictions based on time period or language were applied. Case reports, case series, literature reviews, conference abstracts, grey literature, and descriptive studies were excluded. Additional papers were included through hand searching of references of included papers.

Stage 3: Study selection

Studies were included if they explored the impact of race/ethnicity and/or migrant status on OASI risk in high-income countries. The outcome of interest was OASI (3rd or 4th degree perineal laceration).

Two reviewers (MP & GMM) independently screened titles and abstracts of the articles retrieved from the search for study eligibility. Disagreements were resolved through discussions with both reviewers. If disagreements persisted, conflicts were raised until a consensus was reached. Articles deemed potentially eligible were carried forward for full-text screening by the two reviewers, independently using Covidence software (<https://www.covidence.org/>) to select the final articles using the predefined inclusion and exclusion criteria.

Stage 4: Charting the data

I extracted study characteristics including title, last name of first author, year of publication, country, objective, study design, race/ethnicity/migrant groups included, and the population group with highest rates of OASI.

Stage 5: Collating, summarizing, and reporting results

A content analysis was conducted to thoroughly examine the risk factors that were identified a priori. Additionally, existing knowledge gaps that must be addressed through future research

were identified. Common characteristics of the existing studies were also identified. Co-authors reviewed content, provided feedback, suggested modifications and provided insights.

2.3 Results

2.3.1 Article Characteristics

2821 studies were identified through the initial database search. After removing duplicates, 1763 studies remained. Following screening and full-text review, 32 studies remained (Figure 1). The 32 included studies varied by publication date, from 2001 to 2022. The characteristics of included studies can be found in table 1. Out of 32 studies, slightly more than half originated from the US (n=17/32) and 25% were conducted in Western Europe (n=8/32). 81.25% (n=26/32) of studies were published post-2010. The selected studies varied in design, with most being retrospective cohort studies (n=23/32, 71.88%). Other included study designs were systematic reviews, secondary analyses of randomized clinical trials, retrospective observational, prospective cohort, and case-control studies.

2.3.2 Content Analysis

The following risk factors were analyzed: race/ethnicity, causal mechanisms behind race/ethnicity as a risk factor (perineal length, obesity and BMI, and language barrier) and migration.

Race/ethnicity and OASI

All selected studies contained an analysis of at least two race/ethnicity groups' OASI incidence. Race/ethnicity groups in the studies included Latina, white, Black, Asian, Pacific

Islander, Multiracial individuals. Most studies (n=26/32, 81.25%) reported non-white groups such as Filipino, Sub-Saharan African Immigrant, and Black women as having a higher risk of OASI.

Asian race/ethnicity as a risk factor of OASI

Most of the studies included Asian population groups in their analysis (n=27/32, or 84.38%). Half of these studies, (n=16/32) included data on subgroups of Asian identities, whether by regions such as Southeast Asia, or by countries such as the Philippines. More than half of the total number of included studies reported the highest rates of OASI amongst individuals of Asian race/ethnicity or migration background (n=21/32, or 65.63%). Despite finding higher rates of OASI in Asian populations as a prominently discussed risk factor, Wheeler et al. (95) was the only study that systematically reviewed this topic. The authors reported that although Asian ethnicity was not found to be a risk factor in Asia, studies conducted in Western countries found a higher likelihood of OASI among Asian individuals (95).

Causal mechanisms behind race/ethnicity as a risk factor of OASI

Only a small number of studies (n=6/32, or 18.75%) investigated potential causal mechanisms, excluding migration, underlying the association between race/ethnicity and OASI. The mechanisms explored were perineal length, language barrier and obesity. No published work identified religious racism as a causal mechanism.

Perineal length

Tsai et al. (96) and Yeaton-Massey et al. (97) examined perineal length as a causal mechanism between race/ethnicity and OASI. Tsai et al. (96) examined the perineal lengths of white, Filipino, Japanese, Chinese, Native Hawaiian, or Micronesian individuals and found no difference among the groups (96). Similarly, Yeaton-Massey et al. (97) examined the white, African American, Latina, Asian, multiracial, Native American, Middle Eastern, and other individuals to find that a shorter perineum did not increase one's risk of OASI.

Obesity and BMI

Obesity as a causal mechanism between race/ethnicity and OASI was examined by Yamasato et al. (98) and Schwartz et al. (99). Yamasato et al. (98) examined Asian, Native Hawaiian, Other Pacific Islander, white, Black, American Indian, Alaskan Native individuals to deduce if there was an association between OASI, maternal BMI, and maternal race. The authors found no difference in BMI among the different groups once adjusting for maternal age, race, and parity. This concluded that BMI was not a causal mechanism underlying the relationship between race/ethnicity and OASI (98).

Schwartz et al. (99) examined white, Chinese, Asian non-Chinese, Hispanic, and African-American individuals to test if OASI risk is related to body mass index (BMI) or to a relative fetal-maternal size disproportion. This was measured by examining the ratio of the newborn birthweight (BW) to maternal BMI (BW:BMI) (99). The authors found that Chinese individuals had a higher risk of OASI compared to white and Hispanic individuals (99). The study's multivariable analysis found that newborn birth weight plays a role and that BW:BMI ratio was a stronger predictor of OASI than birth weight or BMI alone (99). However, BW:BMI ratio did not explain the association between Chinese race/ethnicity and higher risk of OASI (99).

Language barrier

Schrot-Sanyan et al. (100) was the only article to explore the impact of language on OASI as an independent risk factor for OASI. The authors examined individuals who identified as white, African, Asian, or other, and found language barriers to be an independent risk factor for OASI. This is because language barriers increased the time required to effectively communicate one's health concerns and other logistics, such as directions to the correct medical department (100).

Migrant status as a risk factor of OASI

Eight studies (30,101–107) included migrant population groups in their analyses. Most of these studies (n=6/8, 75%) reported that migrants were at a higher risk of OASI. Armbrust et al. (101) reported no difference and Gumundsdottir et al. (102) identified migrant group as experiencing higher risk only in multiparous, and not primiparous, group. Two studies solely examined specific migrant backgrounds; Boxall et al. (103) studied individuals with a Vietnamese migration background in Germany, and Shah et al. (104) analyzed Chinese immigrants in the United Kingdom. Both studies found that Vietnamese and Chinese immigrants were at a higher risk of experiencing OASI (103,104). The remaining studies included various migrant backgrounds. The population groups found to be at highest risk according to the remaining studies (30,105–107) were South Asian, Eritrean, immigrants of Sub-Saharan African origin, and immigrants of South Asian origin respectively.

Armbrust et al. (101) conducted a perinatal data analysis of immigrant and German Women in Berlin and found no difference in the OASI between German natives and immigrant groups (101). Despite this, the authors found notable differences when it came to the usage of

anesthesia, oxytocin, and uterine stimulants. A German study by Armbrust et al. (101) found no difference in the caesarean delivery rates, episiotomy, higher grade perineal tears and severe postpartum haemorrhage between those born in Germany and immigrant groups. Despite this, the authors found notable differences when it came to the usage of anesthesia, oxytocin, and uterine stimulants (101).

Gumundsdottir et al. (102) found that migrant individuals from countries with a high Human Development Index score (≥ 0.900) were reported to have similar or improved outcomes than Icelandic individuals. However, migrant individuals who originated from countries with a lower Human Development Index score than Iceland (< 0.900) were at a higher risk of perinatal complications, including postpartum hemorrhage. In their analysis of OASI specifically, the authors found that Icelandic individuals were at a higher risk of injury among primiparous groups, while migrant individuals were at higher risk among multiparous groups (102).

Sorbye et al. (107) was a notable study as it analyzed migrants' length of residence and paternal birthplace to determine individuals' ethnic origin. The authors concluded that individuals from Asia were at higher risk of OASI compared to those who originated from Norway. In addition, those with a short period of residence and those with foreign-born partners were found to experience a higher risk (107). The authors concluded that in order for equitable care to be achieved, existing barriers to effective utilization of health systems and patient-provider relations must be removed (107).

Table 1. Characteristics of included studies in the scoping review

Title	Author, Year	Study Design	Country	Timeline (years)	Primary Analysis	Race/ethnicity/migrant country of origin explored	Population group with highest rates of OASI
Obstetric anal sphincter lacerations	Handa 2001(57)	Retrospective study	United States	1992-1997	Frequency of obstetric anal sphincter laceration and to identify associated characteristics	white, Hispanic, Black, Filipina, Other Pacific Islander, Indian, other Asian, Native American	Indian
Racial differences in severe perineal lacerations after vaginal delivery	Goldberg 2003 (108)	Retrospective cohort study	United States	1983-2000	Maternal race and rates of third- and fourth-degree laceration after vaginal delivery	white, Black, Asian, Hispanic	Asian
Racial/ethnic differences in perineal, vaginal and cervical lacerations	Hopkins 2005 (109)	Retrospective cohort study	United States	1976-2004	Variation between ethnicities for risk of perineal, vaginal, and cervical laceration at vaginal delivery	white, Japanese, Filipinos, Pacific Islanders	Filipino
Demographic variations and clinical associations of episiotomy and	Ogunyemi 2006 (110)	Retrospective cohort study	United States	1982-2001	Risk factors for both episiotomy and severe perianal lacerations	Hispanic, African American	African American

severe perineal lacerations in vaginal delivery							
Perineal trauma and postpartum perineal morbidity in Asian and non-Asian primiparous women giving birth in Australia	Dahlen 2008 (111)	Secondary analysis of randomized clinical trial	Australia	1997-2004	Postpartum perineal morbidity of primiparous Asian and non-Asian women who had a vaginal birth	Asian, Non-Asian	Asian
Predictors of severe perineal lacerations in Chinese women	Schwartz 2009 (99)	Retrospective cohort study	United States	2001-2006	Body mass index (BMI) or to a relative fetal-maternal size disproportion as a risk factor of OASI	white, Chinese, Non-Chinese Asian, Hispanic, African-American	Asian
The obstetric performance of Chinese immigrants residing in the U.K.	Shah 2011(104)	Case-control study	England	2006-2008	Differences in demographic and obstetric outcomes between Chinese immigrant and British-born white women in the United Kingdom	Chinese, British white	Chinese
Pregnancy outcome of migrant women delivering in a public institution in northern Italy	Zanconato 2011 (106)	Retrospective cohort study	Italy	2005-2009	Pregnancy outcomes in native and immigrant women in Italy	Non-migrant Italian, Migrants of central and Eastern European, South and East Asian, Middle East and North African, Sub-Saharan African,	Sub-Saharan African Immigrant Women

						Central and South American origin	
Perineal body length among different racial groups in the first stage of labor	Tsai 2012 (96)	Prospective study	United States (Hawaii)	2009-2011	Differences in perineal body length between racial groups	white, Filipino, Japanese, Chinese, Native Hawaiian, Micronesian	white
Is Asian ethnicity an independent risk factor for severe perineal trauma in childbirth? A systematic review of the literature	Wheeler 2012 (95)	Systematic Review	United States (Hawaii)	2000-2010	Asian ethnicity as an independent risk factor for OASI	Asian (Filipino, Japanese, Korean, Chinese, Indian, Indian, Pakistani, Bangladeshi, Vietnamese, Other), white, African, Foreign-born, Latina, white non-Latina, Black	Asian
Paradoxical trends and racial differences in obstetric quality and neonatal and maternal mortality	Howell 2013 (112)	Retrospective cohort study	United States	2000-2009	Trends by race in Agency for Healthcare Research and Quality obstetric-related quality	white, Black	white
Third and fourth degree perineal injury after vaginal delivery: does race make a difference?	deSilva 2014 (113)	Retrospective cohort study	United States (Hawaii)	2002-2003	Rates of severe perineal injury in different Asian and Pacific Islander subgroups	Hawaiian, Filipino, white, Chinese, Micronesian, Multi-Racial, Other Pacific Islander, Other Asian, Other	white
Maternal quality and safety outcomes for Asians	Sentell 2014		United States (Hawaii)	2008 to 2012	Maternal quality and safety outcomes for Asians	Filipino, Native Hawaiian, other Pacific Islander (e.g., Samoan, Tongan, Micronesian), Japanese, Chinese, white, and other	Chinese

and Pacific Islanders in Hawaii: an observational study from five years of statewide data					and Pacific Islanders in Hawaii		
Maternal Asian ethnicity and the risk of anal sphincter injury	Davies-Tuck 2015 (114)	Retrospective cohort study	Australia	2006-2012	Associations between maternal Asian ethnicity (South Asian and South East/East Asian) and anal sphincter injury	Australia/ New Zealand, South Asia, South East/East Asia	South Asian
Racial and ethnic disparities in maternal morbidity and obstetric care	Grobman 2015 (115)	Retrospective cohort study	United States	2008-2011	Relationship between maternal race and rates of third- and fourth-degree laceration after vaginal delivery	Non-Hispanic, white, Non-Hispanic Black, Hispanic, Asian	Asian
Racial/ethnic variations in perineal length and association with perineal lacerations: a prospective cohort study	Yeaton-Massey 2015 (97)	Prospective cohort study	United States	2008-2010	Association between race/ethnicity, perineal length and OASI	African-American, Latina, white, Asian, Multiracial, Native American, Middle Eastern, other	Asian

A Retrospective Perinatal Data Analysis of Immigrant and German Women from Representative Birth Cohorts at the Virchow Hospital, Berlin	Armbrust 2016 (101)	Retrospective cohort Study	Germany	1974, 1984-1994	Differences in the level of obstetric care provided to immigrant and German women	Non-migrant German, Turkish migrant, Other migrant	No difference
Maternal Language and Adverse Birth Outcomes in a Statewide Analysis	Sentell 2016	Retrospective cohort study	United States (Hawaii)	2012	Differing birth outcomes by language for US Asian and Pacific Islanders	Chinese, Filipino, Hawaiian, Japanese, Micronesian, white, other	Chinese & Japanese
Episiotomy and severe perineal trauma among Eastern African immigrant women giving birth in public maternity care: A population based study in Victoria, Australia	Belihu 2017 (105)	Retrospective observational study	Australia	1999-2007	Episiotomy use and incidence of severe perineal tear for women born in Eritrea, Ethiopia, Somalia and Sudan compared with Australian-born women	Non-migrant born in Australia, migrants born in Eritrea, Ethiopia, Somalia, Sudan	Eritrea
Are Asian American women at higher risk of severe perineal lacerations?	Quist-Nelson 2017 (116)	Retrospective cohort study	United States	2012	Asian race as an independent risk factor for severe perineal lacerations	white, Asian American, Latina, Asian/Pacific Islander, Native American, Other	Asian

Increased Perinatal Morbidity and Mortality Among Asian American and Pacific Islander Women in the United States	Siddiqui 2017 (117)	Retrospective cohort analysis	United States	2002-2013	Risk of maternal mortality observed in Asian Americans and Pacific Islanders compared with white women	white, Asian American, Pacific Islander	Asian American, Pacific Islander
Perinatal Outcome in Women with a Vietnamese Migration Background - Retrospective Comparative Data Analysis of 3000 Deliveries	Boxall 2018 (103)	Retrospective cohort study	Germany	2010-2015	Associations between primary or secondary caesarean delivery and different child outcomes depending on the migration background	Non-migrant German, Vietnamese migrants	Vietnamese migrants
The Great Divide: Country of birth as a risk factor for obstetric anal sphincter injuries	Brown 2018 (30)	Retrospective cohort study	Australia	2009-2015	Risk of OASIS associated with country of birth	Australia, New Zealand, South Asia, South-East Asia, Other Asia, Middle East, Other	South Asian
Prospective comparison of obstetric anal sphincter injury incidence between an Asian and Western hospital	Bates 2019 (118)	Prospective observational study	Hong Kong, China, and Australia	2015-2016	OASIS rates in primiparous Asian women in an Asian and Western birth units	East Asian, Southeast Asian	Asians in Western settings

Racial/Ethnic Differences in Perineal Lacerations in a Diverse Urban Healthcare System	Williams 2019 (119)	Retrospective cohort study	United States	2010–2014	Variations between races/ethnicities in OASI at first vaginal delivery	Latina, white, Black, Asian, Pacific Islander, Other, Multiracial	white
Associations Between Maternal Obesity and Race, with Obstetric Anal Sphincter Injury: A Retrospective Cohort Study	Yamasato 2019 (98)	Retrospective cohort study	United States (Hawaii)	2008–2015	Association between maternal BMI, race and OASI	white, Black, American Indian, Alaskan Native Asian, Native Hawaiian, Other Pacific Islander	Asian
Maternal Ethnicity and the Risk of Obstetrical Anal Sphincter Injury: A Retrospective Cohort Study	Albar 2021 (120)	Retrospective cohort study	Canada	2014–2017	Maternal ethnicity as a risk factor for obstetrical anal sphincter injury (OASI)	Asian, Black, white, Other	Asian
Challenges in migrant women's maternity care in a high-income country: A population-based cohort study of maternal and perinatal outcomes	Gumundsdottir 2021 (102)	Prospective population-based cohort study	Iceland	1997–2018	Maternal and perinatal outcomes of migrant women in Iceland	Icelandic, Migrant background	Primiparous: Icelandic Multiparous: migrant
Validation of ethnicity in	Jardine 2021 (121)	Retrospective cohort study	England	2015–2017	Accuracy of coding of	white, South Asian, Black, Multiracial, other	Black

administrative hospital data in women giving birth in England: cohort study					ethnicity in National Health Service (NHS) administrative hospital records compared with self-declared records in maternity booking systems		
Language barrier as a risk factor for obstetric anal sphincter injury - a case-control study	Schrot-Sanyan 2021(100)	Case-control study	Germany	2001-2016	Incidence of OASI in women presenting a language barrier	white, African, Asian, other	African
Comparison of adverse perinatal outcomes between Asians and Caucasians: a population-based retrospective cohort study in Ontario	Zeng 2021 (122)	Retrospective cohort study	Canada	2015-2017	Independent adjusted relative risks and adjusted risk difference of OASI for Asians compared with white individuals	Asian, white	Asian
Obstetric anal sphincter injury by maternal origin and length of residence: a nationwide cohort study	Sorbye 2022 (107)	Retrospective cohort study	Norway	2008-2017	To estimate the association between maternal origin and obstetric anal sphincter injury (OASI), and	South Asian, Southeast Asian, East Asian & the Pacific, Sub-Saharan African migrants	South Asian migrants

					assess if associations differed by duration of residence		
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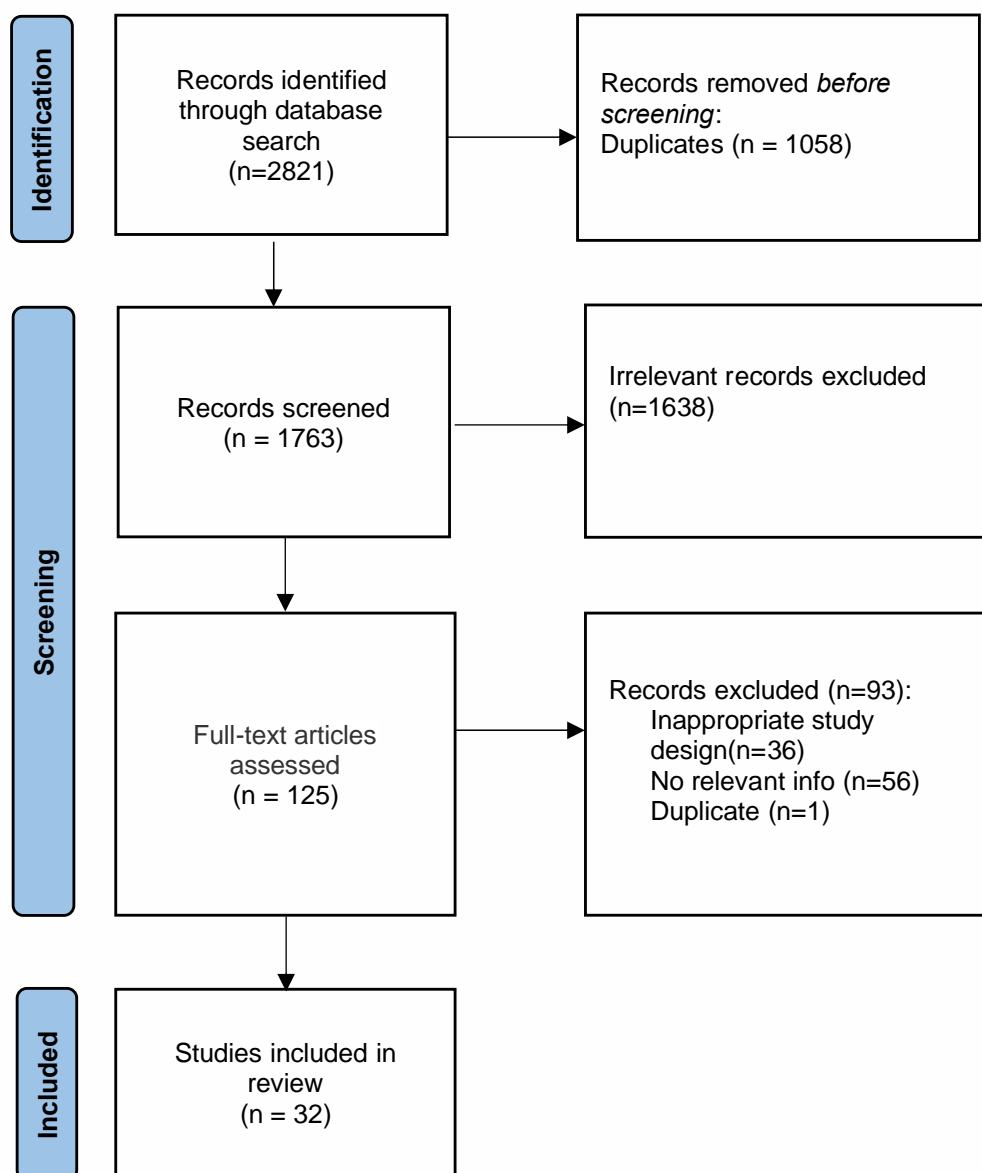


Figure 1. Identification of studies included in the scoping review

2.4 Discussion

The scoping review extracted the following risk factors: race/ethnicity as a risk factor, causal mechanisms behind race/ethnicity as a risk factor (perineal length, obesity and BMI, and language barrier) and migration as a risk factor. Non-white individuals as well as those who were identified as migrants were found to have an increased risk of OASI, with Asian individuals reported to experience highest risk. No causal mechanisms studied were able to consistently explain this phenomenon.

These findings provide a strong foundation for further research in related topics, as well as policy and clinical practice implications. The studies have confirmed that race should not be examined as a biological phenomenon but rather indicates that the intersection of various social factors, such as migration, may lead to inadequate healthcare and health inequities (107).

There are several notable characteristics among some of the studies that did not report non-white individuals as having the highest risk of experiencing OASI. Tsai et al. (96) and de Silva et al. (113) both found the highest rates of OASI in white groups. However, both studies were conducted in Hawaii, which boasts the highest Asian population within the US (123). This may indicate that patients or healthcare in this region maintains unique characteristics which alter the risk of OASI. As well, Armburst et al. (101) was a study conducted in Germany which only examined German origin, Turkish origin, and “other” as the race/ethnicity groups. The study found no difference in the incidence of perineal tear among the three groups.

Several knowledge gaps were identified in this study, which must be addressed through future research. First of all, the review of the literature identified Asian race/ethnicity as a prominent risk factor of OASI. However, existing research has shown that individuals of Asian

descent residing in Asia do not experience high rates of OASI (95,107,118). Despite this, an updated review on the topic has not been published since 2012 (95). This highlights the need to further explore and address the specific challenges, in the form of structural barriers, faced by Asian individuals in relation to obstetric anal sphincter injuries. I was also unable to find studies that quantified OASI risk experienced by different Asian population groups.

The scoping review has confirmed that migrant status and non-white race/ethnicity lead to increased OASI risk. However, a significant knowledge gap when it comes to understanding the mechanisms behind race/ethnicity and migration' intersection in impacting OASI outcomes. It has been reported that the impact of migration differs significantly by race/ethnicity (124). The intersectional nature of race/ethnicity and migration produces unique experiences and OASI outcomes for individuals, and it is imperative that this relationship is explored further through qualitative and quantitative studies. As most structural barriers are complex and interrelated, it is crucial to conduct qualitative research that explores the firsthand experiences and perspectives of BIPOC individuals.

Most importantly, targeted policy and clinical practice interventions to address the specific challenges experienced by BIPOC and/or migrant individuals must be implemented. For instance, migrant individuals may face challenges with language barriers. Providing access to interpreters early in the antenatal period must be prioritized so that individuals may facilitate discussion surrounding birth, consent and culturally competent healthcare. This would ensure effective communication and enhance overall patient safety.

Strengths and Limitations

This scoping review provides a comprehensive understanding of the literature surrounding the risk factors of race/ethnicity and migrant status on OASI outcomes. To my knowledge, this study represents the first scoping review of this topic, making it a valuable contribution to the existing body of knowledge. The explored risk factors can be used to guide future research and policies as well as clinical decision-making.

However, this study is not without its limitations. The most significant constraint of this study, as consistently evidenced by various studies investigating race and ethnicity, is the diversity of racial categorizations (121). For example, several studies such as Siddiqui et al. (117) and Quist-Nelson et al. (116) classified Asian and Pacific Islanders as a single race/ethnicity group in their analysis. This grouping fails to consider the diverse range of ethnicities and cultures within these groups and could result in misleading biases. This is because there is a lack of international standard definition regarding the term ‘Asian’ (95).

It is also critical to acknowledge that there are limited data available on obstetric trauma experienced by Indigenous and Black populations. The content analysis of the current literature demonstrated that Asian race/ethnicity is a significant risk factor for OASI. However, this finding does not signify that Asian race/ethnicity is the most at-risk population group for obstetric anal sphincter injuries. The lack of race-based data and research in this area may contribute to an incomplete understanding of the experiences of various population groups in relation to OASI. For example, as demonstrated in a study by Grimes et al. (125) which examined subjects’ race and ethnicity in federally funded pelvic floor research, race/ethnicity was not consistently reported and even in publications that did report race/ethnicity, people of colour were largely underrepresented.

Similarly, there is a lack of qualitative work/mixed-methods design studies that might shed light on the quantitative findings. Understanding the first-hand lived experiences of BIPOC individuals would reveal non-quantifiable aspects of their experiences with OASI, such as the ways stigma may impact their access to healthcare resources and services.

Future Directions

Future research that further aims to understand additional OASI risk experienced by BIPOC individuals experience must be pursued. Systematic review and meta-analysis to quantify the increased risk that certain population groups may face would be beneficial in understanding existing disparities. Specifically, the identified knowledge gap in this study demonstrates that a meta-analysis focusing on Asian individuals' increased OASI is warranted. Epidemiological studies using accurate race-based data to corroborate the findings will be crucial in discovering any existing patterns, trends, and any other relevant insights. Additionally, mixed-methods and qualitative research studies to specifically address the causal mechanisms especially related to migration status, communication, provider experience and training, obstetric racism and overall discrimination must be pursued. By gaining patient perspectives through qualitative research, nuanced experiences and barriers faced by BIPOC individuals can be better addressed.

2.5 Conclusion

Although some studies indicated that white individuals had higher rates of OASI than other races/ethnicities, this scoping review provides evidence that non-white populations, as well as migrants, are at a higher risk of OASI when compared to individuals who identify as white and/or non-migrants. By exploring migrant status and race/ethnicity as risk factors, as well as potential causal mechanisms behind race/ethnicity and OASI risk, this scoping review highlight

the need for accurate and specific racial/ethnic data collection in order to identify potential disparities and address them effectively.

Chapter 3

Asian-white Disparities in Obstetric Anal Sphincter Injury: A Systematic Review and Meta-Analysis¹

3.1 Background

As outlined in the Journal of Obstetrics and Gynecology Canada (JOGC)'s guide, scoping reviews act as “precursors to systematic reviews, probing wide-ranging questions” (120, p.1355). The scoping review outlined in the previous chapter brought to my attention that Asian-white disparities in OASI is a pervasive health issue in non-Asian, high-income countries which should be examined. However, studies have found that Asian individuals living in their country of origin do not experience a higher risk of OASI (95,107,118).

Thus, a systematic review and meta-analysis was conducted to quantitatively evaluate and synthesize published studies on the incidences of OASI in Asian individuals, specifically. I hypothesized that OASI occurs more frequently in Asian vs. white individuals in high-income, non-Asian countries.

3.2 Methods

Study Design

This systematic review has been registered in the International Prospective Register of Systematic Reviews (PROSPERO; registration no. CRD42022379141). The study was conducted and reported in accordance with the Preferred Reporting Items for Systematic Review

¹ Accepted for publication in the American Journal of Obstetrics & Gynecology (AJOG) Global Reports

and Meta-Analysis (PRISMA) guidelines and Meta-analysis of Observational Studies (MOOSE) recommendations (127). Further details of the study methods have been previously published (128). The selected studies included individuals with a vaginal delivery of a live or stillborn infant in non-Asian, high-income countries, which was slightly refined from the originally proposed population (which did not specify a restriction to non-Asian, high income countries) (128).

Identification of Studies

MEDLINE, OVID, Embase, Emcare, and Cochrane databases were searched from inception to March 2023 for observational studies using keywords and controlled vocabulary terms related to race, ethnicity and OASI with the help of an information scientist (Appendix Table 2).

Additional papers were included through hand searching of references of included papers. All observational studies, including cross-sectional, case-control, and cohort were included. Case reports, case series, literature reviews, conference abstracts, grey literature, and descriptive studies with no comparisons to the white population group were excluded from the review. No restrictions based on language were applied. Studies that did not provide sufficient information to calculate effect size were excluded.

Studies with all criteria satisfying the PECO (Population-Exposure-Comparator-Outcome) framework were included in the review (Appendix Table 3). Asian individuals were categorized using the United Nations (UN) geographical classification (129). Studies that aggregated individuals of Asian origins with other groups were not included. Due to the absence of standard definitions, misuses of the terms ‘ethnicity’, ‘race’, and ‘ancestry’ have been reported (23–26,31). In this study, the term ‘race’ is used to reflect socio-political inequalities, which are

often based on physical differences such as skin and eye colour (24,30,31). Ethnicity is defined by cultural factors including language and nationality (31).

Study Selection

Studies were included if they compared OASI in Asian individuals with white individuals. The white population served as the comparison group as they are the dominant ethnic group in non-Asian, high-income countries and remain unaffected by the institutional racism that underlies racial inequities in health. Studies that aggregated white individuals with other racial groups were excluded.

The outcome of interest was OASI (3rd or 4th degree perineal laceration). Third-degree lacerations involve a partial or complete disruption of the internal and/or external anal sphincter. Fourth-degree lacerations involve the disruption of the anal mucosa in addition to laceration of the external and internal anal sphincter (52,130–132).

Two reviewers (MP & GMM) independently screened titles and abstracts of the articles retrieved from the search for study eligibility. Disagreements were resolved through discussions with both reviewers. If disagreements persisted, conflicts were raised with the wider study team until consensus was reached. Articles deemed potentially eligible were carried forward for full-text screening by the two reviewers, independently, using Covidence (<https://www.covidence.org/>) to select the final articles using the predefined inclusion and exclusion criteria.

Data Extraction

Two reviewers (MP & GMM) extracted study characteristics including last name of first author, year of publication, country, study design, sample size, overall incidence of OASI, race/ethnicity groups included, Asian subgroups examined, method used to specify race/ethnicity, method used to identify OASI and confounders included in adjusted models. The number of events, number of Asian and white individuals, unadjusted and adjusted odds ratios (OR) as well as 95% confidence intervals (CI) from each study were also included.

Quality Assessment

Two reviewers (MP, GMM) independently assessed the methodological quality of studies using the Joanna Briggs Institute Critical Appraisal tools (133), which evaluate risk of bias using a checklist of ten/eleven items. These items were answered with “yes,” “no,” “maybe” or “not applicable.” A numerical score was then calculated (yes=1, no/unclear/not applicable=0). A total score greater than 7 was considered indicative of low risk of bias, while scores between 4 and 7 were classified as medium risk, and those between 1 and 3 were categorized as high risk of bias. Reviewers resolved any disagreement in bias assessment by discussion.

Statistical Analyses

Meta-analysis was performed using RevMan 5.4 for dichotomous data using the random effects model and the odds ratios (ORs) with 95% confidence intervals (CIs) as the measures of effect. I calculated unadjusted ORs for all studies reporting raw data using the Mantel-Haenszel method. Separate random-effects models were also used to pool the reported adjusted ORs for all studies reporting adjusted estimates using the inverse variance method. I assessed the heterogeneity of studies using the I^2 statistic. Heterogeneity was considered significant when the I^2 is greater than 50%, following Cochrane Collaboration recommendations (134). Case-control studies were

taken out of crude measures of dichotomous analyses as incidence cannot be derived from case-control data.

A random-effects meta-regression was performed using the restricted maximum likelihood (REML) method in SAS 9.4 (SAS Institute Inc, Cary, NC) to assess the effects of differences in study characteristics on between-study heterogeneity (135). In particular, for each study I obtained the proportion of Asians in the source population, study design (hospital-based vs. population-based), and subgroup of Asian individual studied (e.g., Chinese, Indian, Japanese, unspecified 'Asian').

Subgroup analyses were performed using studies that compare OASI in specific Asian subgroups such as South Asian (Indian), Filipino, Chinese, and Japanese individuals compared with white individuals. An additional subgroup analysis based on study setting (hospital-based vs. population-based studies) was also conducted. Additionally, I sought to explore reasons for these disparities among the included studies that evaluated any potential causal mechanism. Publication bias was assessed by visual inspection of funnel plots and formally tested using the Begg rank correlation test and Egger regression asymmetry (136,137).

3.3 Results

2827 articles were identified in the literature search and removed 1065 duplicates (Figure 1). Titles and abstracts of the remaining 1762 articles were screened for eligibility. A full text review was conducted of 124 articles and found a total of 27 that fulfilled eligibility criteria. The overall quality of studies was moderate, as the risk of bias scores ranged from 5 to 8 (Appendix Tables 4-5; Appendix Figure 1-2).

Among the 27 studies, a total of 22 studies provided sufficient data to be included in the dichotomous analysis, which included 2,337,803 individuals; 463,973 identified as Asian and 1,873,830 as white. 17 of the 27 studies reported adjusted odds ratios for OASI among Asian vs. white individuals and were included in the second meta-analysis using the inverse variance method. Among these 17 studies, relative estimates of OASI were reported for specific subgroups of Asian individuals in 7 studies.

Description of Included Studies

The 27 included studies were conducted between 1989 and 2022 in Australia (n=1) Canada (n=2), the US (n=15), and Western Europe (n=9) (Table 2). Study designs consisted of prospective cohort studies (n=3), retrospective cohort studies (n=22), and case-control studies (n=2). Nine of the 27 studies reported subgroup analyses of Asian individuals. There were 16 hospital-based studies and 11 population-based studies.

Five of the 27 studies included in this review attempted to identify factors that could explain the observed association between Asian race and OASI. Factors believed to contribute to these disparities were perineal length, body-mass-index (BMI), fetal-maternal size disproportion, obesity, and primary language. Despite these efforts, the causal mechanisms remain unclear and are likely multifactorial.

Association of Asian Versus white Race With OASI

Nearly all studies reported higher rates of OASI among Asian versus white individuals (n=23/27), with an up to three-fold higher rate of OASI in the Asian group. The pooled incidence of OASI among the 22 studies that reported risk of OASI in Asian vs. white individuals using

dichotomous data demonstrated higher risk in Asian individuals: 6.48% compared with 4.49% among white individuals. The meta-analysis of dichotomous estimates showed a 1.64-fold increase in OASI among Asian vs. white individuals (95% CI 1.48-1.80; Figure 3) with a very high level of between-study heterogeneity ($I^2=94\%$).

The higher rate of OASI in Asian vs. white groups was similar in the synthesis of adjusted estimates using the inverse variance method (pooled OR 1.75, 95% CI 1.51-2.01; Figure 4). The studies included in this meta-analysis included confounders such as maternal age and pre-pregnancy BMI, parity, operative vaginal delivery, position of the fetal head at delivery and infant birth weight. Despite adjustment for confounders, heterogeneity between studies remained high ($I^2 = 96\%$).

Subgroup Analyses

The pooled estimates were not significantly different between the subgroup analysis of hospital-based studies (OR 1.48, 95% CI 1.22-1.78) and population-based studies (OR 1.74, 95% CI 1.52-1.98; Appendix Figures 3-4). However, lower heterogeneity and more precise estimates were observed in studies using population-based data. In the meta-analysis of adjusted estimates of OASI among Asian vs. white individuals in hospital-based studies (OR 1.67, 95% CI 1.39-2.00) and population-based studies (OR 1.88, 95% CI 1.49-2.37), lower heterogeneity in the hospital-based data was observed (Appendix Figure 5-6).

Seven studies included data on subgroups of Asian individuals (i.e., South Asian [n=2], Filipino [n=8], Chinese [n=8], Japanese [n=5]). The pooled ORs among the South Asian, Chinese, and South-East Asian/Filipino subgroups showed similar relative estimates of OASI (South Asian OR 1.80, 95% CI 1.15-2.80, Chinese OR 1.57, 95% CI 1.16-2.12; South-East

Asian OR 1.52, 95% CI 1.26-1.82), while the pooled OR for OASI among Japanese vs. white individuals showed no association (OR 1.00, 95% CI 0.63-1.57) (Appendix Figure 7-10).

Heterogeneity could not be explained by fitting meta-regression models accounting for proportion of Asian individuals in the source population of each study, differences in study design, or subgroup of Asian studied (Table 3). When considering all the covariates, I found decreasing disparity between OASI rates in Asian vs. white groups as the proportion of Asians in the source population increased (coefficient=-0.017, $p=0.002$), although significant residual homogeneity was present in the adjusted model ($I^2=89\%$). Results of Begg's test ($p=0.65$) and Egger's test ($p=0.96$) confirmed that there was no evidence of publication bias (Figure 5; Appendix Figure 11).

Table 2. Characteristics of included studies in the systematic review and meta-analysis

Author, Year	Study Design	Country	Study period	Number of total participants ²	Hospital based/Population based	Asian groups explored	Variables included in adjusted analyses	Race/ethnicity measurement	Method of OASI ascertainment
Green & Soohoo, 1989(138)	Retrospective Cohort Study	United States	1985-1987	4,172	Hospital based	Filipino Chinese	N/A	Self-identified ethnicity	Computerized data from hospital databases
Combs et al, 1990(139)	Retrospective Cohort Study	United States	January 1975-July 1988.	2,832	Hospital based	Chinese Filipino Japanese	-Midline -Episiotomy -Nulliparity -Second-stage arrest - Occipito-posterior position -Low or mid station -Use of forceps instead of vacuum use of local anesthesia	Computerized data from hospital database	Computerized data from hospital database
Handa et al, 2001(57)	Retrospective Cohort Study	United States	1992-1997	2,101,843	Population based	Filipino Indian Other Asian	-Parity -Maternal age -Maternal race -Insurance status	Health Planning and Development, which links California birth	Diagnostic and procedure codes from database

² The number of patients include all patients included in the study and is not restricted to the Asian and white populations.

Author, Year	Study Design	Country	Study period	Number of total participants ²	Hospital based/Population based	Asian groups explored	Variables included in adjusted analyses	Race/ethnicity measurement	Method of OASI ascertainment
							-Obstetric-characteristics -Obstetric-interventions	certificates to maternal and newborn discharge records	
Goldberg et al, 2003(108)	Retrospective Cohort Study	United States	1983-2000	34,048	Hospital based	Asian	-Childbirth -Race -Maternal age -Spontaneous vaginal delivery -Forceps -Small/large for gestational age -Episiotomy -Insurance	Self-identified and nurse-assessed race	International classification of diseases–9th revision diagnosis codes, documented in hospital electronic medical database
Hopkins et al, 2005(109)	Retrospective Cohort Study	United States	1976-2001	17,216	Population based	Japanese Filipino	-Maternal age -Maternal pre-pregnancy weight -Birth weight -Gestational age -Operative delivery (forceps, vacuum) -Epidural anesthesia -Prolonged second stage	Self-identified ethnicity, collected from University of California, San Francisco database	University of California, San Francisco perinatal database

Author, Year	Study Design	Country	Study period	Number of total participants ²	Hospital based/Population based	Asian groups explored	Variables included in adjusted analyses	Race/ethnicity measurement	Method of OASI ascertainment
							-Occiput posterior position, -Accoucheur role (faculty, resident) -Health insurance status (private, Medicaid)		
Guendelman et al, 2006(140)	Retrospective Cohort Study	United States (California)	1996-1998	1,426,854	Population based	Asian	-Social characteristics (age, parity, income, education) -Month of PNC initiation -Hospital quality of care at delivery	Utilization of data from the California Office of State Health Planning and Development, linked with birth certificates	Data from the California Office of State Health Planning and Development (OSHDP).
Dua et al, 2009(141)	Prospective Cohort Study	England	2005-2007	984	Hospital based	Asian	N/A	“National Statistics Classification”	The midwives at Royal Blackburn Hospital attend regular mandatory training

Author, Year	Study Design	Country	Study period	Number of total participants ²	Hospital based/Population based	Asian groups explored	Variables included in adjusted analyses	Race/ethnicity measurement	Method of OASI ascertainment
									workshops on examination and identification of obstetric anal sphincter injury following delivery. The tears were graded according to the classification described by Sultan
Schwartz et al, 2009(99)	Retrospective Cohort Study	United States	2001-2006	3,085	Hospital based	Chinese Asian Non-Chinese	-Previous term vaginal delivery -Maternal age at delivery -Operative vaginal delivery -Newborn birth weight -Pre-pregnancy BMI -Ratio newborn birth weight	Self-identified ethnicity and country of origin	Computerized outpatient centre database

Author, Year	Study Design	Country	Study period	Number of total participants ²	Hospital based/Population based	Asian groups explored	Variables included in adjusted analyses	Race/ethnicity measurement	Method of OASI ascertainment
Baghurst et al, 2012(142)	Retrospective Cohort Study	Australia	2002–2008	65,889	Population based	Asian	N/A	Pregnancy Outcome Statistics Unit in South Australia (SA) Health.	Pregnancy Outcome Statistics Unit in South Australia (SA) Health
Tsai et al, 2012	Prospective Cohort Study	United States (Hawaii)	2009–2011	200	Hospital based	Filipino Japanese Chinese	N/A	Race of the subject's parents and grandparents collected from hospital database-no information on whether self-identified or not	Data from medical centre database
Gurol-Urganci et al, 2013(77)	Retrospective Cohort Study	United Kingdom (England)	2000–2012	1,035,253	Population based	Asian	-Maternal demographic factors -Socio-economic deprivation of the mother's area of residence	Database	Procedure codes, inputted into database
de Silva et al, 2014(113)	Retrospective Cohort Study	United States (Hawaii)	2002–2003	1,842	Hospital based	Filipino Chinese Asian	-Episiotomy -Operative vaginal delivery	Self-identified race	Electronic medical records

Author, Year	Study Design	Country	Study period	Number of total participants ²	Hospital based/Population based	Asian groups explored	Variables included in adjusted analyses	Race/ethnicity measurement	Method of OASI ascertainment
Sentell et al, 2014(143)	Retrospective Cohort Study	United States (Hawaii)	2008-2012	75,725	Population based	Filipino Japanese Chinese	-Age group -Payer -Rural vs. urban hospital location -Multiple gestation -High-risk pregnancy	Self-identified race, collected from hospital database	Data from inpatient data source
Vathanan et al, 2014(144)	Retrospective Cohort Study	United Kingdom (England)	2006-2009	12,612	Hospital based	Asian Oriental	-Mode of delivery (Ventouse, Forceps) -Episiotomy -Birth weight -Age of the mother -Parity	Hospital database	Hospital database
Aiken et al, 2015(145)	Retrospective Cohort Study	United Kingdom	Unclear	4,831	Hospital based	Asian Chinese	-Time in second stage -Birth weight -Maternal age -Maternal BMI -Place of delivery -Shoulder dystocia -Use of epidural analgesia	Computerized database	Hospital electronic medical records

Author, Year	Study Design	Country	Study period	Number of total participants ²	Hospital based/Population based	Asian groups explored	Variables included in adjusted analyses	Race/ethnicity measurement	Method of OASI ascertainment
Grobman et al, 2015(115)	Retrospective Cohort Study	United States	2008-2011	115,502	Population based	Asian	-Patient characteristics	Hospital chart	Computerized databases
Kapaya et al, 2015(146)	Case-control study	England	2003-2012	2,572	Hospital based	Asian	-Age -Parity -Primiparity -BMI -Gestational age -Labor -Induction -Episiotomy -Birth weight	Maternity record database	Maternity record database
Yeaton-Massey et al, 2015(97)	Prospective Cohort Study	United States	2008-2010	344	Hospital based	Asian	N/A	Self-identified race and ethnicity	Electronic medical record
Durnea et al, 2018(147)	Retrospective Cohort Study	United Kingdom	1999-2014	45,557	Hospital based	Asian (Subcontinent) Asian (South-Eastern)	-BMI -Age -Ethnicity -Smoking -Parity -Pregnancy duration -Episiotomies -Instrumental delivery -Birth weight	Electronic medical records	Electronic medical records
Ramm et al, 2018(148)	Retrospective Cohort Study	United States	2013-2014	22,822	Population based	Asian	-Demographic -Health -Delivery	Self-identification	Electronic medical records

Author, Year	Study Design	Country	Study period	Number of total participants ²	Hospital based/Population based	Asian groups explored	Variables included in adjusted analyses	Race/ethnicity measurement	Method of OASI ascertainment
Jardine et al, 2019(149)	Retrospective Cohort Study	England	2013-2014	192,057	Population based	Asian	-Primiparity -Previous elective caesarean -Previous emergency caesarean -Mode of delivery -Episiotomy -Prolonged labour -Shoulder dystocia -Birthweight -Age -Deprivation	Maternity record	Procedure codes
Williams et al, 2019(119)	Retrospective Cohort Study	United States	2010–2014	1,179	Hospital based	Asian	-Baby's weight and head circumference -Mother's age -Episiotomy -Insurance status -Gestational age -Operative delivery -BMI -Occiput-	Self-identified race and ethnicity	Electronic medical record

Author, Year	Study Design	Country	Study period	Number of total participants ²	Hospital based/Population based	Asian groups explored	Variables included in adjusted analyses	Race/ethnicity measurement	Method of OASI ascertainment
							posterior delivery		
Yamasato et al, 2019(98)	Retrospective Cohort Study	United States (Hawaii)	2008-2015	25,594	Hospital based	Asian	-Birthweight -Episiotomy -Fetal head position -Operative vaginal delivery -Parity -Shoulder dystocia	Self-identified race	Procedure codes from hospital database
Albar et al, 2021(120)	Retrospective Cohort Study	Canada	2014-2017	11,012	Hospital based	Asian	N/A	Self-identified ethnicity	Electronic medical records
Jardine et al, 2021(121)	Retrospective Cohort Study	United Kingdom (England)	2015-2017	1,237,213	Population based	South Asian	Not Applicable	Self-reported	Two data sets, linked together for the purpose of the National Maternity and Perinatal Audit (NMPA) in England: administrative data for the hospital admission resulting in

Author, Year	Study Design	Country	Study period	Number of total participants ²	Hospital based/Population based	Asian groups explored	Variables included in adjusted analyses	Race/ethnicity measurement	Method of OASI ascertainment
									the birth episode from (Hospital Episode Statistics (HES)) records; and maternity data from maternity information systems.
Schrot-Sanyan et al, 2021(100)	Case-control study	Paris, France	2001-2016	334	Hospital based	Asian	-Age -Previous vaginal delivery -Delivery Mode -Prophylactic episiotomy -Birth weight	Ethnicity extracted from hospital records- no information on whether self-identified or not	Procedure codes from hospital database
Zeng et al, 2021(122)	Retrospective Cohort Study	Canada	2015-2017	237,293	Population based	Asian	N/A	Self-identified race	Provincial perinatal database registry

Table 3. Meta-regression estimates

Covariate	Estimate	SE	P-value	95% Confidence interval		I ²
				Lower	Upper	
Overall model	0.548	0.084	<0.001	0.384	0.713	96
Proportion Asian among source population	-0.012	0.004	0.004	-0.020	-0.004	89
Study design						91
Hospital-based	0.202	0.169	0.231	-0.129	0.533	
Population-based	0 (Ref)	-	-	-	-	
Asian subgroup						90
Chinese	-0.360	0.242	0.188	-0.792	0.155	
Filipino/South-East Asian	-0.035	0.181	0.846	-0.390	0.320	
Japanese	-0.777	0.311	0.013	-1.387	-0.167	
South Asian	0.290	0.326	0.373	-0.348	0.928	
All Asian	0 (Ref)	-	-	-	-	

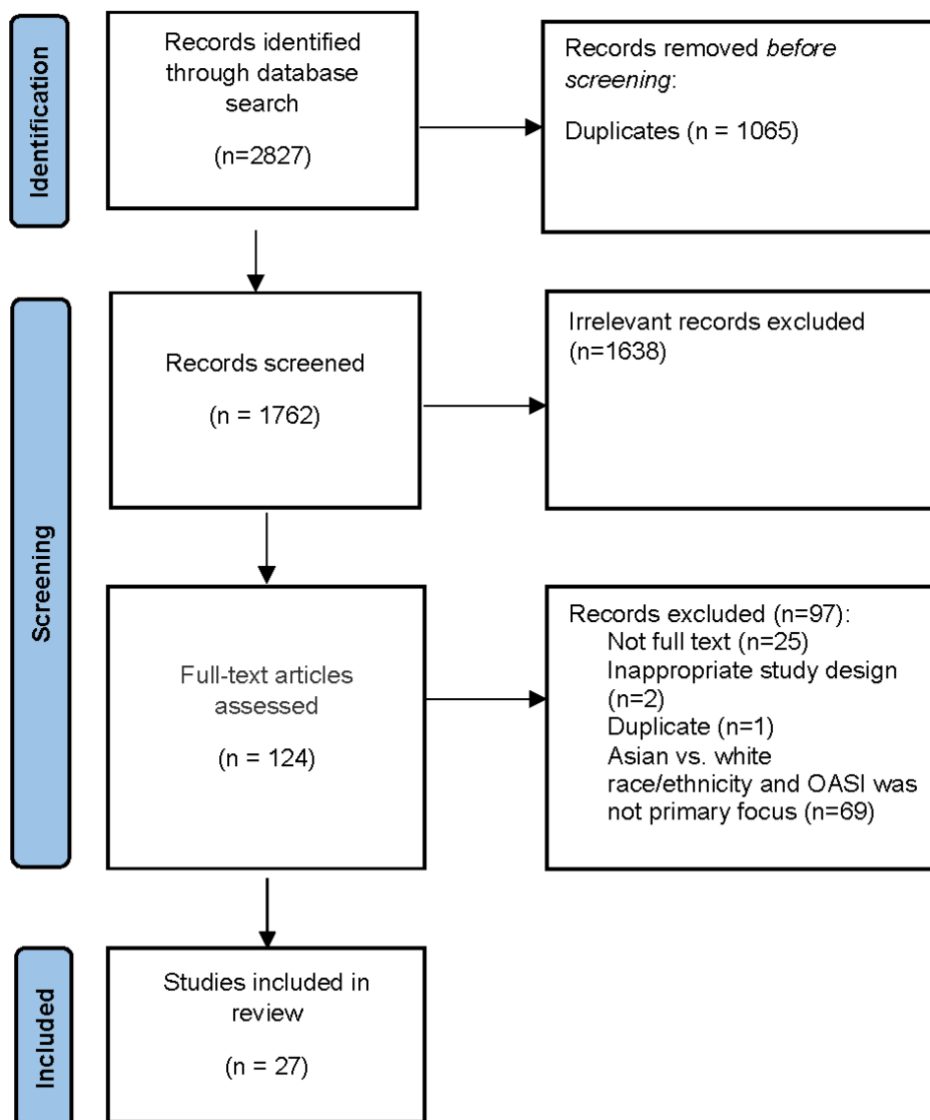


Figure 2. Identification of studies included in the systematic review

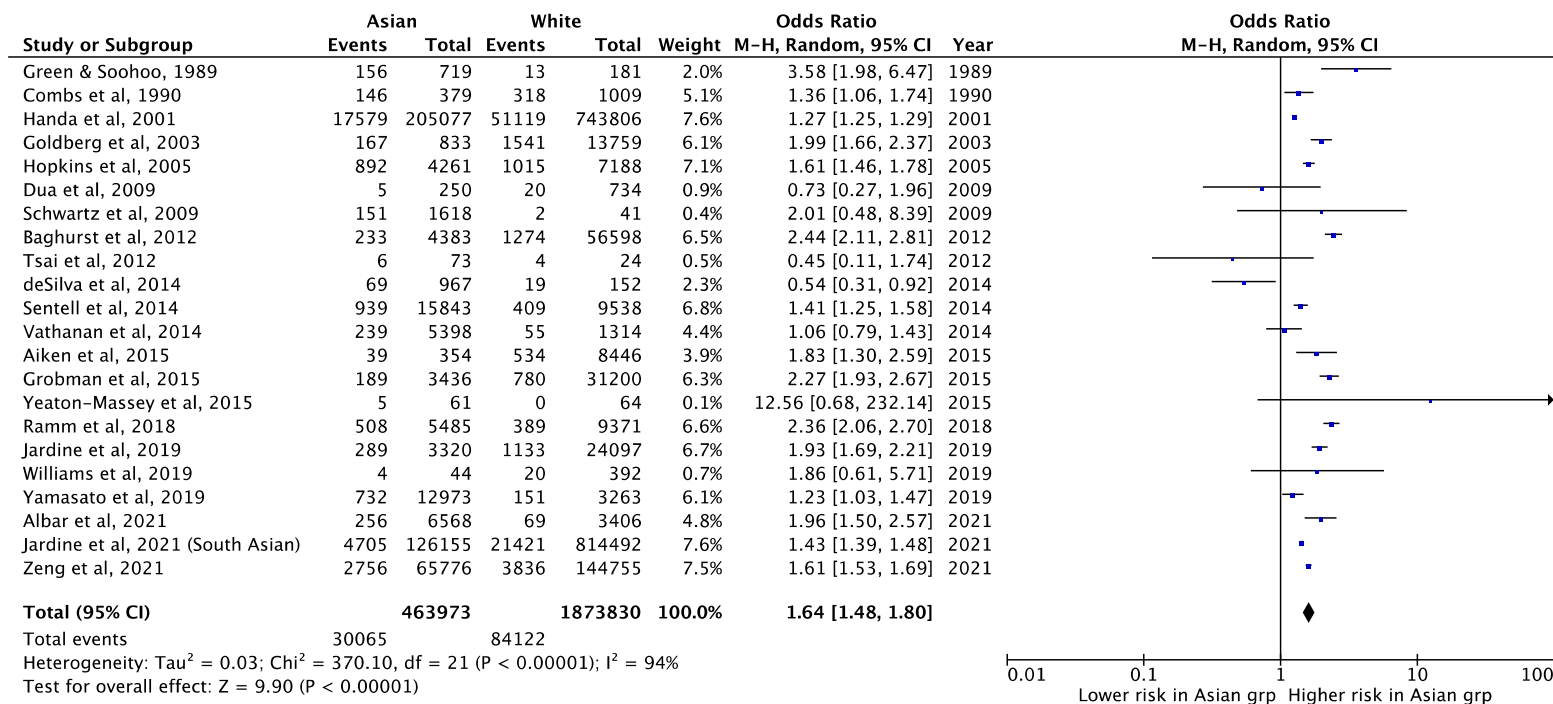


Figure 3. Odds ratios and 95% confidence intervals for obstetric anal sphincter injury (OASI) of Asian vs. white individuals among studies reporting dichotomous data. Meta-analysis performed using the random effects dichotomous method.

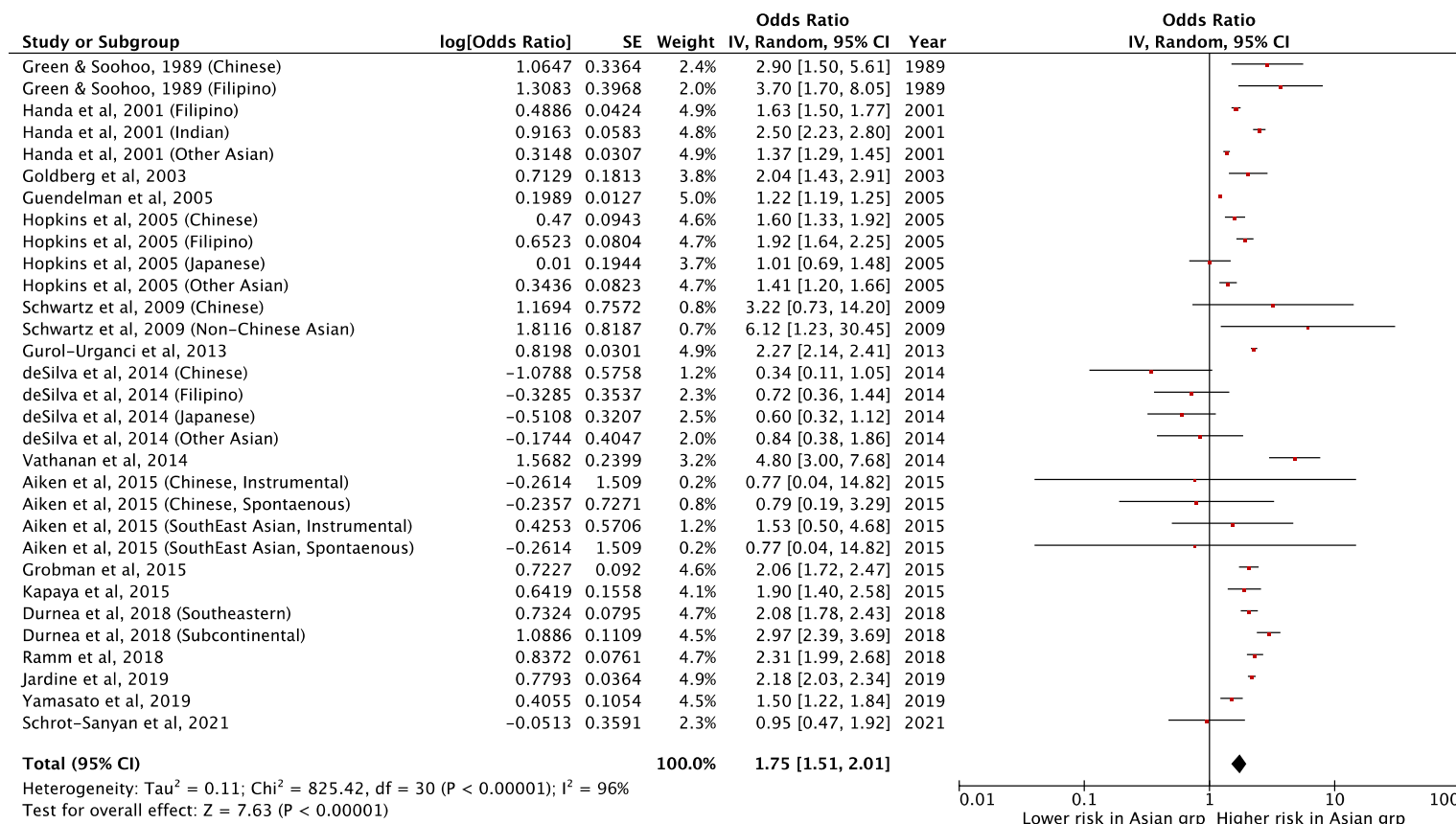


Figure 4. Odds ratios and 95% confidence intervals for obstetric anal sphincter injury (OASI) of Asian vs. white individuals among studies reporting adjusted odds ratios. Meta-analysis performed using the random effects inverse variance method.

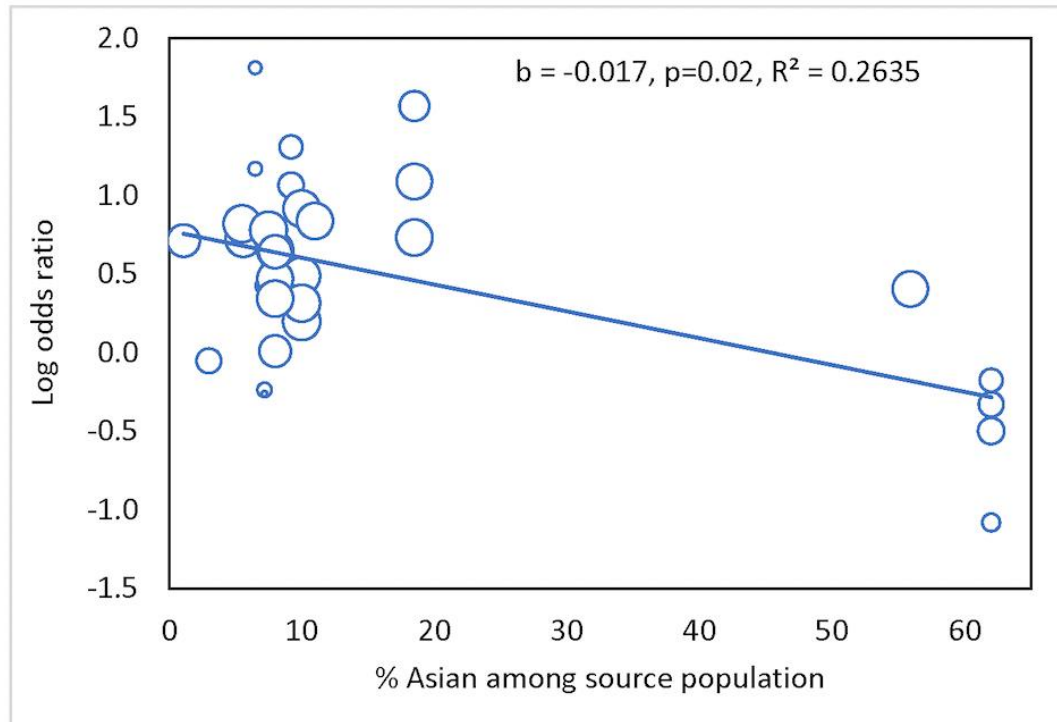


Figure 5. Meta-regression assessment of heterogeneity. Linear meta-regression between log-odds and proportion of Asian individuals in each source population (intercept: 0.774, slope: -0.017 , p -value: 0.002).

3.4 Discussion

This systematic review and meta-analysis found that Asians have a higher risk of OASI compared with white individuals in high-income, non-Asian countries, and this association was found among studies that reported both crude and adjusted estimates. Previous studies have evidenced that Asian race/ethnicity is not associated with high rates of OASI among individuals residing in Asia. Thus, the 85% of studies included in this systematic review have demonstrated higher rates of OASI among Asian individuals residing in several non-Asian countries. This suggests that social factors, such as racism, or yet unidentified factors relating to obstetric practices in different countries, are contributing to these disparities in OASI rates.

The observed rates of OASI are highest in the South Asian group; however, these findings should be interpreted with caution, given only two studies were included. Considering the severe, long-term, quality-of-life impairing consequences of OASI, understanding and mitigating these disparities should be a priority. In contrast, no difference was observed in OASI rates between Japanese and white individuals. Notably, this was the sole subgroup that did not report higher risk among Asians compared to white individuals. This finding may be due to the fact that three of five included studies were conducted in Hawaii. Studies conducted in Hawaii may indicate that patients or healthcare in this region maintain unique factors that alter the risk of OASI. For example, Hawaii has the highest population of Asians among all states in the US (123).

De Silva et al. (113) and Tsai et al. (96) were among the three studies that included Japanese subgroup analyses and reported a lower risk of OASI among Asian vs. white populations in dichotomous data analyses. Both were single centre studies conducted in

Honolulu, Hawaii, and little to no South Asians were included in either study, which may directly influence the prevalence of OASI in the Asian group. The only other study in the meta-analysis of dichotomous data that found a lower rate of OASI in the Asian vs. white group was Dua et al. (141), potentially due to the higher rate of primiparous individuals in the white group and the lack of adjustment for parity (141).

A systematic review (95) conducted in 2012 found that rates of OASI among Asian individuals residing in Asian countries were similar to those observed in non-Asian populations. By contrast, those who were identified as Asian had up to four-fold higher rates of OASI compared with white individuals in non-Asian countries. This updated review includes additional studies since 2012 and a meta-analysis was conducted to additionally quantify the results.

Some studies have explored the effect of differences in obstetric care in the association between race and OASI. Sentell et al. (150) uniquely analyzed racial disparities in OASI among spontaneous vaginal deliveries and operative vaginal deliveries (forceps/vacuum). The examined Asian racial/ethnic groups consisted of: Filipino, Japanese, and Chinese. The study reported that both Japanese and Chinese individuals demonstrated high rates of OASI compared with those who identify as white (150). The authors noted that these findings persisted, despite the fact that Japanese and Chinese populations were not limited in healthcare access or overall health profiles (150).

Causal mechanisms to explain the association between Asian race and OASI

Tsai et al. (96) and Yeaton-Massey et al. (97) explored perineal length and its effect on perineal lacerations, and reported that the mean perineal body length did not differ notably by race. The authors also found no direct relationship between perineal length and perineal laceration.

Schwartz et al. (99) discussed BMI and fetal-maternal size disproportion among Chinese individuals and found that neither variable was found to directly impact the likelihood of OASI (99). Despite this, Chinese ethnicity remained an independent risk factor of OASI during vaginal delivery (99). Yamasato et al. (98) explored obesity as a causal mechanism and revealed that BMI ≥ 50 kg/m² resulted in lower OASI prevalence. The authors also reported increased rates of OASI among Asian individuals; however, when adjusting for maternal age, race, and parity, no difference in BMI groups was found. Schrot-Sanyan et al. (100) examined language as a causal mechanism between race and OASI. The authors concluded that non-English speakers were at an increased risk, along with those of African origin and those who underwent occipito-posterior delivery and prolonged labor duration.

There are several potential factors that may elucidate the increased risk of OASI among Asian vs. white individuals. First, differences were observed in commonly provided obstetric care within Asian versus white patients. For example, episiotomy has been reported to be performed more often in Asian individuals compared to white individuals (115). Causal mechanisms for this remain unknown; patient characteristics, such as parity, were not found to explain this distinction (115).

As well, there is a notable lack of representation within healthcare workers and physician bias towards the patients and practices of different backgrounds (151,152). Lack of diversity among clinicians has been found to play a role in creating disadvantageous care experiences for Asian and other BIPOC individuals as healthcare professionals are often not representative of the larger patient population. It is important to train healthcare professionals on the importance of practicing greater cultural humility and structural competence in order to provide culturally competent care (153,154). Several studies reported that their participants emphasized the

importance of employing healthcare providers who were of the same ethnicity, were knowledgeable, and respectful of their cultural practices, or those who were open to learning (155–158).

These discrepancies became further detrimental with language barriers and the lack of support many BIPOC individuals face when giving birth (114,155,159–161). For example, confusion distinguishing the words ‘breathe’ and ‘push’ due to language barriers during birth have been reported (114). In a study by Seo et al. (161), the authors examined childbirth experiences of Korean immigrant women in the US. It was reported that “even though most participants had interpreting services (e.g., telephone interpreters, Korean nurses, or family members), these services were not available at all times, which was especially problematic during active labor and delivery” (158, p.309). Additionally, feeling lost in the new healthcare environment, limited childbirth choices, and experiences of cultural insensitivity were reported. For recent migrants accessing a health-care system that they are unfamiliar with, inadequate knowledge and socioeconomic barriers can magnify vulnerability (152,160).

Several recent works have highlighted that it is racism, not race/ethnicity, that is directly impacting patients’ health outcomes (13,162). As mentioned previously, the intersection of obstetric violence and medical racism leads to obstetric racism, manifested in the form of stigma, lack of access to quality care and more (4). Obstetric racism can further intersect with migrant status to exacerbate these inequities.

Strengths and Limitations

Studies included in this review represent several countries/regions and the overall sample size exceeded 2,338,293 individuals, which increase the generalizability of the study’s findings. I

applied a strict definition of Asian origin that utilized the UN geographical classification system (129) and applied other rigorous standards such as excluding studies which defined groups by country of birth instead of race/ethnicity. The subgroup analyses by specific Asian subgroups (e.g., Chinese, Japanese, Indian) revealed heterogeneity in the relationship between specific Asian race/ethnicity and OASI. In addition, this review included representation from three continents and was able to confirm pervasive inequities across high-income, non-Asian settings. The enduring gap in understanding the factors contributing to these inequities was revealed, as was the need for future studies to explore causal mechanisms underlying the increased incidence of OASI among Asian individuals. Lastly, this work highlights the critical need for more accurate collection of race-ethnicity data (e.g., the use of self-reporting) to advance health equity. Findings from this study may inform obstetric healthcare practice guidelines on issues related to equitable and accessible care for diverse populations.

The main limitation of this review is the residual heterogeneity in racial categories due to the challenge of measuring race/ethnicity despite the efforts made to minimize this variation. Most ascertainment of racial and ethnic identifiers is largely lacking in completeness and accuracy (121). This was particularly seen in multiethnic individuals, as they were faced with limited categories to represent their identities (121). As well, challenges in the measurement of Asian-white disparities result from dichotomous Asian versus white categorizations that cannot capture the complexity with which race/ethnicity impacts maternal outcomes. Since the exposure of 'race' is inherently unclear, classifying people into heterogeneous groups (e.g., 'Asian') is problematic (163). This assumes uniform effects within Asian subpopulations, and dismisses specific subgroup disparities (83). This was seen in the meta-analyses within subgroups, as heterogeneity in the pooled odds ratio decreased significantly once subgroups were analyzed

individually. In addition, to define people with Asian origins, I applied a UN classification system named “standard country or area codes for statistical use (M49)” (129). While comprehensive, this classification scheme has limitations because there are several transcontinental countries, such as Kazakhstan, which can be identified as both Asian and European depending on historical, geographical, and cultural contexts (164,165). Thus, the geographical classification used by the UN may differ from the self-identification of race/ethnicity of study participants or the classification set by the individual papers included in this study. This risks inaccuracies and misrepresentation in studies that pooled Asian race/ethnicity.

In addition, there is a potential additional overlap in population group among some included studies. For example, Sentell et al. (143) examined the discharge data from all Hawaii childbirth hospitalizations from 2008 to 2012, while Yamasato et al. (166) examined a single centre in Honolulu, Hawaii, US between 2008 and 2015.

Lastly, the high heterogeneity in the meta-analyses is a significant limitation and could be influenced by several factors. Firstly, despite efforts to create refined racial categories, residual variability in the classification and identification of race/ethnicity between studies likely remains. Secondly, variability between specific social and environmental factors in different regions may further increase heterogeneity of pooled data. Thus, the level of heterogeneity reflects the limitations that exist in the currently available race-based data. It is also important to note that the heterogeneity does not change the uniform interpretation that Asians are at higher risk of OASI, despite the variation in magnitude.

Research and Clinical Implications

Qualitative and quantitative research to address this knowledge gap is warranted to gain a holistic understanding of birth outcomes within various population groups. This is because birth should not be seen as a phenomenon that is strictly medical; it is also both a social and cultural phenomenon (159). Future studies must consider the intersection of various social factors such as obstetric racism, migrant status, and language barriers.

Researchers must carefully consider when race is an appropriate variable in research, keeping in mind its sociocultural mechanisms (121). Efforts to improve the quality of racial and ethnic coding must be made, to ensure equitable and accurate identification of information (121). An updated and transparent classification tool for self-identified race/ethnicity/ancestry must be pursued by researchers and demographic data collection (27,121).

The evidence of racial disparities synthesized in this review reinforce the critical need for practical solutions to this public health issue. Ante- and post-partum care that is safe for all birthing individuals must be strongly advocated for and implemented through evidence-based care and prioritizing lived birthing experiences (167). Health institutions must enforce cultural sensitivity and anti-racism training and ensure diversity within staff to allow for humanized care (159,168). Health professionals must acknowledge and take initiative to understand the diversity that exists in perinatal care-seeking populations in order to provide adequate person-centred care (159,169). It is of utmost importance for clinicians to actively listen and learn about the needs of BIPOC patients, while recognizing the complexity of obstetric care and OASI (168). Given the impacts that medical racism exerts on health outcomes, it is essential that obstetrical healthcare teams understand the importance of culturally competent, trauma-informed care and be willing to implement such practices in their work.

3.5 Conclusion

Asian individuals giving birth in high-income, non-Asian countries have higher rates of OASI compared with white individuals. Few studies have explored underlying causal mechanisms responsible for this relationship, leaving the causes of these disparities to be determined. This review highlights disparities that exist in current obstetric healthcare systems. Although the causal mechanisms are unclear, multiple countries and contexts are failing to address the health needs of diverse groups. Findings from this review should be considered when developing obstetric trauma-related research and guideline.

Chapter 4

Discussion

4.1 Summary of Findings

The scoping review of the literature on race/ethnicity, migration status and OASI demonstrated that outcomes of injury differ by maternal race/ethnicity, and that these disparities are further exacerbated by migration status. The systematic review and meta-analysis demonstrated a quantitative analysis of the increased risk of OASI among different Asian race/ethnicity groups.

4.2 Strengths and Limitations

This thesis offers a comprehensive and holistic understanding of the impacts of race/ethnicity and migration on OASI. It sheds light on the various critical issues that exist within this scientific literature and how they contribute to the disparities in OASI experienced by different racial and ethnic groups. The critical exploration of race/ethnicity, migration as a social determinant of health, and the role of obstetric racism through an intersectional feminist framework provides a deeper understanding of the factors that contribute to increased risk for racialized populations.

The main limitation of this thesis is the absence of first-hand, qualitative data that explores the experiences of BIPOC in relation to obstetric anal sphincter injury. Such qualitative data could provide valuable insights into the specific challenges and barriers faced by these communities, as well as their perspectives on the role of race, ethnicity, and discrimination in shaping their experiences.

Furthermore, the lack of consistent reporting on race and ethnicity in existing literature poses a significant limitation to the analyses conducted, as previously mentioned. Thus, the analyses in this thesis have made a conscious effort to consider race and ethnicity as social constructs while attempting to provide clear and consistent definitions of race/ethnicity categories.

4.3 Research Implications

Birth should not be seen as a phenomenon that is strictly medical; it is also both a social and cultural phenomenon (159). Thus, qualitative and quantitative studies to expand our understanding of how race/ethnicity and migration affect OASI outcomes in diverse population groups are warranted. All future studies must consider the intersection of various social factors such as obstetric racism, migration status, and language barriers.

It is also essential for researchers to carefully consider when race is an appropriate variable in evidence-based research, keeping in mind its sociocultural mechanisms (121). Efforts to improve the quality of racial and ethnic identifiers collected for use in health research must be made, to ensure equitable and accurate identification of information (121). An updated and transparent classification tool for race/ethnicity/ancestry must be pursued by researchers and demographic data collection (27,121).

There are several factors which must be considered regarding race/ethnicity data collection including perceived sensitivity surrounding the subject matter, resulting in individuals' lack of willingness to truly share their racial/ethnic identity, or limited pre-established categories which may make individual selection difficult (170). This is why self-reporting has been reported

as the most effective method to obtain information on race/ethnicity, in terms of completeness and accuracy (170).

As well, improvements must be made in research protocols when obtaining data on racism for a comprehensive understanding of BIPOC individuals' lived experiences. Researchers must pursue multifaceted approaches to collecting race-based data and incorporate interviews, surveys, and questionnaires to gain an understanding of the individuals' racial identity and experiences. An example of this is the implementation of The Perceptions of Racism Scale (TPRS), which gathers information on African-American adults' lifetime experience of racism (171). This is accomplished by the participants' indication of "the degree to which they agree with statements about racism" (160, p.5).

4.4 Clinical and Policy Implications

Practical clinical and policy solutions for clinicians and medical boards, aimed at reducing prevalent inequities, are warranted (81). Ante-and post-partum care that is safe for all individuals must be strongly advocated for and implemented through evidence-based care which prioritizes the lived experiences of pregnant individuals (167).

Health institutions must enforce anti-discrimination policies while strengthening cultural sensitivity and anti-racism training. The aim of such training must be to promote the delivery of more humanized care for BIPOC and/or migrant patients (159,168). Health professionals must acknowledge and take initiative to understand the diversity that exists in perinatal care-seeking populations in order to provide adequate person-centred care (159,169). It is of utmost importance for clinicians to actively listen and learn about the needs of BIPOC and/or migrant individuals (168).

This may be made possible with the implementation of social programs such as language interpretation services and collaboration with community health workers. Given the impacts that medical racism exerts on health outcomes, it is essential that obstetric healthcare teams understand the importance of holistic, culturally competent care and be willing to implement such practices in their work.

4.5 Significance

The conducted research highlights the need for further research on the social determinants of health, access to care, and obstetric racism in order to gain a comprehensive understanding of the disparities which exist in OASI outcomes.

Findings from this thesis must be considered when pursuing future obstetric trauma-related research and guidelines. This is because ultimately, gaining a deeper understanding of these outcomes will only be possible through an analysis of racism and other social determinants of health. Relying solely on a biomedical lens presents a myopic and limited view of this multi-faceted issue. This thesis advocates for inclusive and culturally competent healthcare and research, to mitigate mortality and morbidity among vulnerable populations (9).

4.6 Conclusion

This thesis explores core concepts, frameworks and important issues surrounding the topic of race/ethnicity, migration and OASI. These insights offer significant context and insight into the complex factors that may contribute to the obstetric outcomes of BIPOC individuals.

The scoping review as well as systematic review and meta-analysis highlight the fact that population groups who identify as people of colour are at an increased risk of OASI in

predominantly white, high-income settings countries. This demonstrates that current obstetric healthcare systems in multiple countries and contexts are sub-optimally addressing the health needs of diverse groups.

It is essential to address the existing disparities in obstetric care outcomes through patient and community centred research. This will guarantee the implementation of holistic strategies that guarantee safety and optimal clinical outcomes for all individuals undergoing childbirth.

References

1. Health is a fundamental human right [Internet]. [cited 2023 Aug 27]. Available from: <https://www.who.int/news-room/commentaries/health-is-a-fundamental-human-right>
2. Byrd WM, Clayton LA. Race, medicine, and health care in the United States: a historical survey. *J Natl Med Assoc.* 2001 Mar;93(3 Suppl):11S-34S.
3. Weßel M, Gerhards SM. “Discrimination is always intersectional” – understanding structural racism and teaching intersectionality in medical education in Germany. *BMC Medical Education.* 2023 Jun 2;23(1):399.
4. Davis DA. Obstetric Racism: The Racial Politics of Pregnancy, Labor, and Birthing. *Med Anthropol.* 2019 Oct;38(7):560–73.
5. Bohren MA, Vogel JP, Hunter EC, Lutsiv O, Makh SK, Souza JP, et al. The Mistreatment of Women during Childbirth in Health Facilities Globally: A Mixed-Methods Systematic Review. *PLoS Med.* 2015 Jun;12(6):e1001847; discussion e1001847.
6. Davis DA. Reproducing while Black: The crisis of Black maternal health, obstetric racism and assisted reproductive technology. *Reprod Biomed Soc Online.* 2020 Nov 1;11:56–64.
7. Owens DC, Fett SM. Black Maternal and Infant Health: Historical Legacies of Slavery. *Am J Public Health.* 2019 Oct;109(10):1342–5.
8. MBRRACE-UK: Mothers and Babies: Reducing Risk through Audits and Confidential Enquiries across the UK | MBRRACE-UK | NPEU [Internet]. [cited 2023 Dec 7]. Available from: <https://www.npeu.ox.ac.uk/mbrance-uk>

9. Vedam S, Stoll K, Taiwo TK, Rubashkin N, Cheyney M, Strauss N, et al. The Giving Voice to Mothers study: inequity and mistreatment during pregnancy and childbirth in the United States. *Reproductive Health*. 2019 Jun 11;16(1):77.
10. Green TL, Zapata JY, Brown HW, Hagiwara N. Rethinking Bias to Achieve Maternal Health Equity. *Obstet Gynecol*. 2021 May;137(5):935–40.
11. MacLellan J, Collins S, Myatt M, Pope C, Knighton W, Rai T. Black, Asian and minority ethnic women's experiences of maternity services in the UK: A qualitative evidence synthesis. *J Adv Nurs*. 2022 Jul;78(7):2175–90.
12. McCourt C, Pearce A. Does continuity of carer matter to women from minority ethnic groups? *Midwifery*. 2000 Jun 1;16(2):145–54.
13. Ghidei L, Murray A, Singer J. Race, Research, and Women's Health: Best Practice Guidelines for Investigators. *Obstetrics & Gynecology*. 2019 Apr;133(4):815.
14. Delmar R. What Is Feminism? In: *Theorizing Feminism*. 2nd ed. Routledge; 2001.
15. Feminist Theory – Theoretical Models for Teaching and Research [Internet]. [cited 2023 Aug 22]. Available from:
<https://opentext.wsu.edu/theoreticalmodelsforteachingandresearch/chapter/feminist-theory/>
16. Hailu EM, Carmichael SL, Berkowitz RL, Snowden JM, Lyndon A, Main E, et al. Racial/ethnic disparities in severe maternal morbidity: An intersectional lifecourse approach. *Annals of the New York Academy of Sciences*. 2022;1518(1):239–48.

17. Crenshaw K. Mapping the Margins: Intersectionality, Identity Politics, and Violence against Women of Color. *Stanford Law Review*. 1991;43(6):1241–99.
18. Juan MJD, Syed M, Azmitia M. Intersectionality of Race/Ethnicity and Gender Among Women of Color and White Women. *Identity*. 2016 Oct 1;16(4):225–38.
19. Cooper B. Intersectionality. In: Disch L, Hawkesworth M, editors. *The Oxford Handbook of Feminist Theory* [Internet]. Oxford University Press; 2016 [cited 2023 Aug 22]. p. 0. Available from: <https://doi.org/10.1093/oxfordhb/9780199328581.013.20>
20. Collective TCR. A Black Feminist Statement. *Women's Studies Quarterly*. 2014;42(3/4):271–80.
21. Shields SA. Gender: An intersectionality perspective. *Sex Roles*. 2008 Sep;59(5–6):301–11.
22. Ontario.ca [Internet]. 2018 [cited 2023 Jun 1]. Glossary. Available from: <https://www.ontario.ca/document/data-standards-identification-and-monitoring-systemic-racism/glossary>
23. Hauck YL, Lewis L, Nathan EA, White C, Doherty DA. Risk factors for severe perineal trauma during vaginal childbirth: a Western Australian retrospective cohort study. *Women Birth*. 2015 Mar;28(1):16–20.
24. Anand SS. Using Ethnicity as a Classification Variable in Health Research: Perpetuating the myth of biological determinism, serving socio-political agendas, or making valuable contributions to medical sciences? *Ethnicity & Health*. 1999 Nov 1;4(4):241–4.

25. Ross PT, Hart-Johnson T, Santen SA, Zaidi NLB. Considerations for using race and ethnicity as quantitative variables in medical education research. *Perspect Med Educ*. 2020 Oct;9(5):318–23.
26. Ma IWY, Khan NA, Kang A, Zalunardo N, Palepu A. Systematic review identified suboptimal reporting and use of race/ethnicity in general medical journals. *J Clin Epidemiol*. 2007 Jun;60(6):572–8.
27. Lu C, Ahmed R, Lamri A, Anand SS. Use of race, ethnicity, and ancestry data in health research [Internet]. OSF Preprints; 2022 [cited 2023 Feb 17]. Available from: <https://osf.io/z4xty/>
28. Ali-Khan SE, Krakowski T, Tahir R, Daar AS. The use of race, ethnicity and ancestry in human genetic research. *HUGO J*. 2011 Dec;5(1):47–63.
29. Chatters LM, Taylor RJ, Schulz AJ. The return of race science and why it matters for family science. *J Fam Theory Rev*. 2022 Sep;14(3):442–62.
30. Brown J, Kapurubandara S, Gibbs E, King J. The Great Divide: Country of birth as a risk factor for obstetric anal sphincter injuries. *Aust N Z J Obstet Gynaecol*. 2018 Feb;58(1):79–85.
31. Use of race, ethnicity, and ancestry data in health research | PLOS Global Public Health [Internet]. [cited 2023 Jan 6]. Available from: <https://journals.plos.org/globalpublichealth/article?id=10.1371/journal.pgph.0001060>

32. Delgado R, Stefancic J. *Critical Race Theory, Fourth Edition: An Introduction*. NYU Press; 2023. 224 p.
33. Pedrioli CA. Under a Critical Race Theory Lens – Brown v. Board of Education: A Civil Rights Milestone and its Troubled Legacy [Internet]. Rochester, NY; 2005 [cited 2023 Oct 10]. Available from: <https://papers.ssrn.com/abstract=2282227>
34. Bridges KM. Critical Race Theory and the Rule of Law. In: Meierhenrich J, Loughlin M, editors. *The Cambridge Companion to the Rule of Law* [Internet]. Cambridge: Cambridge University Press; 2021 [cited 2023 Oct 20]. p. 357–74. (Cambridge Companions to Law). Available from: <https://www.cambridge.org/core/books/cambridge-companion-to-the-rule-of-law/critical-race-theory-and-the-rule-of-law/341B199F43B0D495DE935B701A578651>
35. Borrell LN, Elhawary JR, Fuentes-Afflick E, Witonsky J, Bhakta N, Wu AHB, et al. Race and Genetic Ancestry in Medicine — A Time for Reckoning with Racism. *New England Journal of Medicine*. 2021 Feb 4;384(5):474–80.
36. Yu N, Chen FC, Ota S, Jorde LB, Pamilo P, Patthy L, et al. Larger genetic differences within africans than between Africans and Eurasians. *Genetics*. 2002 May;161(1):269–74.
37. Geneticists should rethink how they use race and ethnicity, panel urges [Internet]. [cited 2023 Dec 3]. Available from: <https://www.science.org/content/article/geneticists-should-rethink-how-they-use-race-and-ethnicity-panel-urges>
38. AP Definitive Source | Why we will lowercase white [Internet]. [cited 2023 Aug 21]. Available from: <https://blog.ap.org/announcements/why-we-will-lowercase-white>

39. Coleman N. Why We're Capitalizing Black. The New York Times [Internet]. 2020 Jul 5 [cited 2023 Oct 10]; Available from:
<https://www.nytimes.com/2020/07/05/insider/capitalized-black.html>
40. Perlman M. Columbia Journalism Review. [cited 2023 Aug 21]. Black and white: Why capitalization matters. Available from: https://www.cjr.org/analysis/language_corner_1.php
41. News · KFM· C. CBC. 2020 [cited 2023 Oct 23]. ANALYSIS | Black with a capital “B”: Why it took news outlets so long to make a change that matters to so many | CBC News. Available from: <https://www.cbc.ca/news/canada/capitalizing-black-style-1.5626669>
42. Laws M. Columbia Journalism Review. [cited 2023 Oct 23]. Why we capitalize ‘Black’ (and not ‘white’). Available from: <https://www.cjr.org/analysis/capital-b-black-styleguide.php>
43. AP News [Internet]. 2020 [cited 2023 Oct 23]. AP says it will capitalize Black but not white. Available from: <https://apnews.com/article/entertainment-cultures-race-and-ethnicity-us-news-ap-top-news-7e36c00c5af0436abc09e051261fff1f>
44. Flanagin A, Frey T, Christiansen SL, AMA Manual of Style Committee. Updated Guidance on the Reporting of Race and Ethnicity in Medical and Science Journals. JAMA. 2021 Aug 17;326(7):621–7.
45. Castañeda H, Holmes SM, Madrigal DS, Young MED, Beyeler N, Quesada J. Immigration as a Social Determinant of Health. Annual Review of Public Health. 2015;36(1):375–92.

46. Chang CD. Social Determinants of Health and Health Disparities Among Immigrants and their Children. *Current Problems in Pediatric and Adolescent Health Care*. 2019 Jan 1;49(1):23–30.
47. Nations U. United Nations. United Nations; [cited 2023 Aug 26]. Migration. Available from: <https://www.un.org/en/global-issues/migration>
48. Wanigaratne S, Shakya Y, Gagnon AJ, Cole DC, Rashid M, Blake J, et al. Refugee maternal and perinatal health in Ontario, Canada: a retrospective population-based study. *BMJ Open*. 2018 Apr 1;8(4):e018979.
49. Yang S, Dahhou M, Bushnik T, Wilkins R, Kaufman JS, Sheppard AJ, et al. Perinatal health among foreign versus native-born mothers in Canada: variations across outcomes and cohorts. *J Public Health (Oxf)*. 2020 Feb 28;42(1):e26–33.
50. Chiu S, Redelmeier DA, Tolomiczenko G, Kiss A, Hwang SW. The health of homeless immigrants. *Journal of Epidemiology & Community Health*. 2009 Nov 1;63(11):943–8.
51. Schmidt PC, Fenner DE. Repair of episiotomy and obstetrical perineal lacerations (first–fourth). *American Journal of Obstetrics and Gynecology* [Internet]. 2023 May 2 [cited 2023 Aug 28]; Available from: <https://www.sciencedirect.com/science/article/pii/S0002937822005415>
52. Harvey MA, Pierce M, Alter JEW, Chou Q, Diamond P, Epp A, et al. Obstetrical Anal Sphincter Injuries (OASIS): Prevention, Recognition, and Repair. *J Obstet Gynaecol Can*. 2015 Dec;37(12):1131–48.

53. Obstetric Trauma (With Instrument) | CIHI [Internet]. [cited 2023 Aug 10]. Available from: <https://www.cihi.ca/en/indicators/obstetric-trauma-with-instrument>
54. Muraca GM, Lisonkova S, Skoll A, Brant R, Cundiff GW, Sabr Y, et al. Ecological association between operative vaginal delivery and obstetric and birth trauma. *CMAJ*. 2018 Jun 18;190(24):E734–41.
55. Muraca GM, Boutin A, Razaz N, Lisonkova S, John S, Ting JY, et al. Maternal and neonatal trauma following operative vaginal delivery. *CMAJ*. 2022 Jan 10;194(1):E1–12.
56. Molyneux R, Fowler G, Slade P. The effects of perineal trauma on immediate self-reported birth experience in first-time mothers. *J Psychosom Obstet Gynaecol*. 2022 Jun;43(2):228–34.
57. Handa VL, Danielsen BH, Gilbert WM. Obstetric anal sphincter lacerations. *Obstet Gynecol*. 2001 Aug;98(2):225–30.
58. Wegnelius G, Hammarström M. Complete rupture of anal sphincter in primiparas: long-term effects and subsequent delivery. *Acta Obstet Gynecol Scand*. 2011 Mar;90(3):258–63.
59. Nilsson IEK, Åkervall S, Molin M, Milsom I, Gyhagen M. Symptoms of fecal incontinence two decades after no, one, or two obstetrical anal sphincter injuries. *American Journal of Obstetrics & Gynecology*. 2021 Mar 1;224(3):276.e1-276.e23.
60. Priddis H, Schmied V, Dahlen H. Women’s experiences following severe perineal trauma: a qualitative study. *BMC Women’s Health*. 2014 Feb 21;14(1):32.

61. Tilak M, Mann GK, Gong M, Koenig NA, Lee T, Geoffrion R. Pelvic floor healing milestones after obstetric anal sphincter injury: a prospective case control feasibility study. *Int Urogynecol J*. 2022 Sep 13;1–9.
62. Handa VL, Blomquist JL, McDermott KC, Friedman S, Muñoz A. Pelvic floor disorders after vaginal birth: effect of episiotomy, perineal laceration, and operative birth. *Obstet Gynecol*. 2012 Feb;119(2 Pt 1):233–9.
63. Okeahialam NA, Sultan AH, Thakar R. The prevention of perineal trauma during vaginal birth. *American Journal of Obstetrics & Gynecology* [Internet]. 2023 Aug 10 [cited 2023 Sep 15];0(0). Available from: [https://www.ajog.org/article/S0002-9378\(22\)00464-1/fulltext](https://www.ajog.org/article/S0002-9378(22)00464-1/fulltext)
64. Muraca GM, Liu S, Sabr Y, Lisonkova S, Skoll A, Brant R, et al. Episiotomy use among vaginal deliveries and the association with anal sphincter injury: a population-based retrospective cohort study. *CMAJ*. 2019 Oct 21;191(42):E1149–58.
65. Hobson S, Cassell K, Windrim R, Cargill Y. No. 381-Assisted Vaginal Birth. *J Obstet Gynaecol Can*. 2019 Jun;41(6):870–82.
66. Okeahialam NA, Wong KW, Thakar R, Sultan AH. The incidence of wound complications following primary repair of obstetric anal sphincter injury: a systematic review and meta-analysis. *American Journal of Obstetrics & Gynecology*. 2022 Aug 1;227(2):182–91.
67. OECD. Obstetric trauma, vaginal delivery with and without instrument, 2019 (or nearest year) and 2020 [Internet]. Paris: Organisation for Economic Co-operation and Development; 2021 [cited 2023 Sep 26]. Available from: <https://www.oecd->

library.org/social-issues-migration-health/obstetric-trauma-vaginal-delivery-with-and-without-instrument-2019-or-nearest-year-and-2020_28659be4-en

68. Muraca GM, Sabr Y, Brant R, Cundiff GW, Joseph KS. Temporal and Regional Variations in Operative Vaginal Delivery in Canada by Pelvic Station, 2004-2012. *J Obstet Gynaecol Can.* 2016 Jul;38(7):627–35.
69. Murphy DJ, Strachan BK, Bahl R, Royal College of Obstetricians and Gynaecologists. Assisted Vaginal Birth: Green-top Guideline No. 26. *BJOG.* 2020 Aug;127(9):e70–112.
70. Johns Hopkins Medicine. Johns Hopkins Medicine. 2021 [cited 2023 Dec 4]. Episiotomy. Available from: <https://www.hopkinsmedicine.org/health/treatment-tests-and-therapies/episiotomy>
71. Robert Barbieri MD. Use of Episiotomy Varies Widely Among U.S. Hospitals. *NEJM Journal Watch* [Internet]. 2015 Jan 21 [cited 2023 Dec 4];2015. Available from: <https://www.jwatch.org/NA36742/2015/01/21/use-episiotomy-varies-widely-among-us-hospitals>
72. Barjon K, Mahdy H. Episiotomy. In: *StatPearls* [Internet]. Treasure Island (FL): StatPearls Publishing; 2023 [cited 2023 Aug 28]. Available from: <http://www.ncbi.nlm.nih.gov/books/NBK546675/>
73. Desplanches T, Marchand-Martin L, Szczepanski ED, Ruillier M, Cottenet J, Semama D, et al. Mediolateral episiotomy and risk of obstetric anal sphincter injuries and adverse neonatal outcomes during operative vaginal delivery in nulliparous women: a propensity-score analysis. *BMC Pregnancy and Childbirth.* 2022 Jan 19;22(1):48.

74. Skinner EM, Dietz HP. Psychological and somatic sequelae of traumatic vaginal delivery: A literature review. *Australian and New Zealand Journal of Obstetrics and Gynaecology*. 2015;55(4):309–14.
75. Khan MM, Kobayashi K, Vang ZM, Lee SM. Are visible minorities “invisible” in Canadian health data and research? A scoping review. *International Journal of Migration, Health and Social Care*. 2017 Jan 1;13(1):126–43.
76. Miao Q, Guo Y, Erwin E, Sharif F, Berhe M, Wen SW, et al. Racial variations of adverse perinatal outcomes: A population-based retrospective cohort study in Ontario, Canada. *PLoS One*. 2022;17(6):e0269158.
77. Gurol-Urganci I, Cromwell DA, Edozien LC, Mahmood TA, Adams EJ, Richmond DH, et al. Third- and fourth-degree perineal tears among primiparous women in England between 2000 and 2012: time trends and risk factors. *BJOG*. 2013 Nov;120(12):1516–25.
78. Ampt AJ, Patterson JA, Roberts CL, Ford JB. Obstetric anal sphincter injury rates among primiparous women with different modes of vaginal delivery. *Int J Gynaecol Obstet*. 2015 Dec;131(3):260–4.
79. Chi Wai T, Cecilia CW, Anny TWM, Hau Yee L. Incidence and Risk Factors of Obstetric Anal Sphincter Injuries after Various Modes of Vaginal Deliveries in Chinese Women. *Chin Med J (Engl)*. 2015 Sep 20;128(18):2420–5.
80. McLeod NL, Gilmour DT, Joseph KS, Farrell SA, Luther ER. Trends in major risk factors for anal sphincter lacerations: a 10-year study. *J Obstet Gynaecol Can*. 2003 Jul;25(7):586–93.

81. Marschalek M, Worda C, Kuessel L, Koelbl H, Oberaigner W, Leitner H, et al. Risk and protective factors for obstetric anal sphincter injuries: A retrospective nationwide study. *Birth*. 2018 Dec;45(4):409–15.
82. Gurol-Urganci I, Bidwell P, Sevdalis N, Silverton L, Novis V, Freeman R, et al. Impact of a quality improvement project to reduce the rate of obstetric anal sphincter injury: a multicentre study with a stepped-wedge design. *BJOG*. 2021 Feb;128(3):584–92.
83. Shah NS, Kandula NR. Addressing Asian American Misrepresentation and Underrepresentation in Research. *Ethnicity & Disease*. 2020;30(3):513–6.
84. Hamed S, Bradby H, Ahlberg BM, Thapar-Björkert S. Racism in healthcare: a scoping review. *BMC Public Health*. 2022 May 16;22(1):988.
85. CCGHR Principles for Global Health Research | CAGH [Internet]. [cited 2023 Aug 25]. Available from: <https://cagh-acsm.org/en/resources/ccghr-principles-global-health-research>
86. THE 17 GOALS | Sustainable Development [Internet]. [cited 2023 Aug 25]. Available from: <https://sdgs.un.org/goals>
87. Admon LK, Winkelman TNA, Zivin K, Terplan M, Mhyre JM, Dalton VK. Racial and Ethnic Disparities in the Incidence of Severe Maternal Morbidity in the United States, 2012-2015. *Obstet Gynecol*. 2018 Nov;132(5):1158–66.
88. Holdt Somer SJ, Sinkey RG, Bryant AS. Epidemiology of racial/ethnic disparities in severe maternal morbidity and mortality. *Semin Perinatol*. 2017 Aug;41(5):258–65.

89. Interactive World Migration Report 2022 [Internet]. [cited 2023 Aug 26]. Available from: <https://www.iom.int/wmr/interactive>
90. Government of Canada SC. The Daily — Immigrants make up the largest share of the population in over 150 years and continue to shape who we are as Canadians [Internet]. 2022 [cited 2023 Aug 26]. Available from: <https://www150.statcan.gc.ca/n1/daily-quotidien/221026/dq221026a-eng.htm>
91. Immigration R and CC. An Immigration Plan to Grow the Economy [Internet]. 2022 [cited 2023 Aug 26]. Available from: <https://www.canada.ca/en/immigration-refugees-citizenship/news/2022/11/an-immigration-plan-to-grow-the-economy.html>
92. Arksey H, O'Malley L. Scoping studies: towards a methodological framework. *International Journal of Social Research Methodology*. 2005 Feb 1;8(1):19–32.
93. PRISMA Extension for Scoping Reviews (PRISMA-ScR): Checklist and Explanation | *Annals of Internal Medicine* [Internet]. [cited 2023 Aug 26]. Available from: <https://www.acpjournals.org/doi/10.7326/M18-0850>
94. Hall DL, Matz DC, Wood W. Why Don't We Practice What We Preach? A Meta-Analytic Review of Religious Racism. *Pers Soc Psychol Rev*. 2010 Feb 1;14(1):126–39.
95. Wheeler J, Davis D, Fry M, Brodie P, Homer CSE. Is Asian ethnicity an independent risk factor for severe perineal trauma in childbirth? A systematic review of the literature. *Women Birth*. 2012 Sep;25(3):107–13.

96. Tsai PJS, Oyama IA, Hiraoka M, Minaglia S, Thomas J, Kaneshiro B. Perineal body length among different racial groups in the first stage of labor. *Female Pelvic Med Reconstr Surg*. 2012;18(3):165–7.
97. Yeaton-Massey A, Wong L, Sparks TN, Handler SJ, Meyer MR, Granados JM, et al. Racial/ethnic variations in perineal length and association with perineal lacerations: a prospective cohort study. *J Matern Fetal Neonatal Med*. 2015 Feb;28(3):320–3.
98. Yamasato K, Kimata C, Burlingame JM. Associations Between Maternal Obesity and Race, with Obstetric Anal Sphincter Injury: A Retrospective Cohort Study. *Hawaii J Med Public Health*. 2019 Jan;78(1):8–12.
99. Schwartz N, Seubert DE, Mierlak J, Arslan AA. Predictors of severe perineal lacerations in Chinese women. 2009 Mar 1;37(2):109–13.
100. Schrot-Sanyan S, Kolanska K, Haimeur Y, Varlas V, Parisot-Liance L, Daraï E, et al. Language barrier as a risk factor for obstetric anal sphincter injury - A case-control study. *J Gynecol Obstet Hum Reprod*. 2021 Oct;50(8):102138.
101. Armbrust R, von Rennenberg R, David M. A Retrospective Perinatal Data Analysis of Immigrant and German Women from Representative Birth Cohorts at the Virchow Hospital, Berlin. *Geburtshilfe Frauenheilkd*. 2016 Nov;76(11):1157–62.
102. Guðmundsdóttir EY, Gottfreðsdóttir H, Hálfðánsdóttir B, Nieuwenhuijze M, Gissler M, Einarsdóttir K. Challenges in migrant women's maternity care in a high-income country: A population-based cohort study of maternal and perinatal outcomes. *Acta Obstet Gynecol Scand*. 2021 Sep;100(9):1665–77.

103. Boxall N, David M, Schalinski E, Breckenkamp J, Razum O, Hellmeyer L. Perinatal Outcome in Women with a Vietnamese Migration Background – Retrospective Comparative Data Analysis of 3000 Deliveries. *Geburtshilfe Frauenheilkd.* 2018 Jul;78(7):697–706.
104. Shah D, Tay A, Desai A, Parikh M, Nauta M, Yoong W. The obstetric performance of Chinese immigrants residing in the UK. *J Obstet Gynaecol.* 2011 Aug;31(6):480–2.
105. Belihu FB, Small R, Davey MA. Episiotomy and severe perineal trauma among Eastern African immigrant women giving birth in public maternity care: A population based study in Victoria, Australia. *Women Birth.* 2017 Aug;30(4):282–90.
106. Zanconato G, Iacovella C, Parazzini F, Bergamini V, Franchi M. Pregnancy Outcome of Migrant Women Delivering in a Public Institution in Northern Italy. *GOI.* 2011;72(3):157–62.
107. Sørbye IK, Bains S, Vangen S, Sundby J, Lindskog B, Owe KM. Obstetric anal sphincter injury by maternal origin and length of residence: a nationwide cohort study. *BJOG.* 2022 Feb;129(3):423–31.
108. Goldberg J, Hyslop T, Tolosa JE, Sultana C. Racial differences in severe perineal lacerations after vaginal delivery. *Am J Obstet Gynecol.* 2003 Apr;188(4):1063–7.
109. Hopkins LM, Caughey AB, Glidden DV, Laros RK. Racial/ethnic differences in perineal, vaginal and cervical lacerations. *Am J Obstet Gynecol.* 2005 Aug;193(2):455–9.

110. Ogunyemi D, Manigat B, Marquis J, Bazargan M. Demographic variations and clinical associations of episiotomy and severe perineal lacerations in vaginal delivery. *J Natl Med Assoc.* 2006 Nov;98(11):1874–81.
111. Dahlen H, Homer C. Perineal trauma and postpartum perineal morbidity in Asian and non-Asian primiparous women giving birth in Australia. *J Obstet Gynecol Neonatal Nurs.* 2008;37(4):455–63.
112. Howell EA, Zeitlin J, Hebert P, Balbierz A, Egorova N. Paradoxical trends and racial differences in obstetric quality and neonatal and maternal mortality. *Obstet Gynecol.* 2013 Jun;121(6):1201–8.
113. de Silva KL, Tsai PJS, Kon LM, Hiraoka M, Kessel B, Seto T, et al. Third and Fourth Degree Perineal Injury After Vaginal Delivery: Does Race Make a Difference? *Hawaii J Med Public Health.* 2014 Mar;73(3):80–3.
114. Davies-Tuck M, Biro MA, Mockler J, Stewart L, Wallace EM, East C. Maternal Asian ethnicity and the risk of anal sphincter injury. *Acta Obstetricia et Gynecologica Scandinavica.* 2015;94(3):308–15.
115. Grobman WA, Bailit JL, Rice MM, Wapner RJ, Reddy UM, Varner MW, et al. Racial and ethnic disparities in maternal morbidity and obstetric care. *Obstet Gynecol.* 2015 Jun;125(6):1460–7.
116. Quist-Nelson J, Hua Parker M, Berghella V, Biba Nijjar J. Are Asian American women at higher risk of severe perineal lacerations? *J Matern Fetal Neonatal Med.* 2017 Mar;30(5):525–8.

117. Siddiqui M, Minhaj M, Mueller A, Tung A, Scavone B, Rana S, et al. Increased Perinatal Morbidity and Mortality Among Asian American and Pacific Islander Women in the United States. *Anesth Analg*. 2017 Mar;124(3):879–86.
118. Bates LJ, Melon J, Turner R, Chan SSC, Karantanis E. Prospective comparison of obstetric anal sphincter injury incidence between an Asian and Western hospital. *Int Urogynecol J*. 2019 Mar;30(3):429–37.
119. Williams A, Gonzalez B, Fitzgerald C, Brincat C. Racial/Ethnic Differences in Perineal Lacerations in a Diverse Urban Healthcare System. *Female Pelvic Med Reconstr Surg*. 2019;25(1):15–21.
120. Albar M, Aviram A, Anabusi S, Huang T, Tunde-Byass M, Mei-Dan E. Maternal Ethnicity and the Risk of Obstetrical Anal Sphincter Injury: A Retrospective Cohort Study. *J Obstet Gynaecol Can*. 2021 Apr;43(4):469–73.
121. Jardine JE, Frémeaux A, Coe M, Gurol Urganci I, Pasupathy D, Walker K. Validation of ethnicity in administrative hospital data in women giving birth in England: cohort study. *BMJ Open*. 2021 Aug 23;11(8):e051977.
122. Zeng N, Erwin E, Wen W, Corsi DJ, Wen SW, Guo Y. Comparison of adverse perinatal outcomes between Asians and Caucasians: a population-based retrospective cohort study in Ontario. *BMC Pregnancy and Childbirth*. 2021 Jan 5;21(1):9.
123. Bureau UC. Census.gov. [cited 2023 Jun 22]. 20.6 Million People in the U.S. Identify as Asian, Native Hawaiian or Pacific Islander. Available from:

<https://www.census.gov/library/stories/2022/05/aanhpi-population-diverse-geographically-dispersed.html>

124. Pitcher BL, Stinner WF, Toney MB. Patterns of Migration Propensity for Black and White American Men: Evidence from a Cohort Analysis. *Res Aging*. 1985 Mar;7(1):94–120.
125. Grimes CL, Clare CA, Meriwether KV, Husk K, Rogers RG. Inadequacy and underreporting of study subjects’ race and ethnicity in federally funded pelvic floor research. *Am J Obstet Gynecol*. 2021 Nov;225(5):562.e1-562.e6.
126. Tulandi T, Suarathana E. Narrative Reviews, Systematic Reviews, and Scoping Reviews. *Journal of Obstetrics and Gynaecology Canada*. 2021 Dec 1;43(12):1355–6.
127. Stroup DF, Berlin JA, Morton SC, Olkin I, Williamson GD, Rennie D, et al. Meta-analysis of observational studies in epidemiology: a proposal for reporting. Meta-analysis Of Observational Studies in Epidemiology (MOOSE) group. *JAMA*. 2000 Apr 19;283(15):2008–12.
128. Park M, Wanigaratne S, D’Souza R, Geoffrion R, Williams SA, Muraca GM. Asian-white disparities in obstetric anal sphincter injury: Protocol for a systematic review and meta-analysis. *PLOS ONE*. 2023 Sep 8;18(9):e0291174.
129. United Nations. Geographic Regions. [cited 2023 Feb 3]. UNSD — Methodology. Available from: <https://unstats.un.org/unsd/methodology/m49/>
130. Sultan AH. Editorial: Obstetrical Perineal Injury and Anal Incontinence. *Clinical Risk*. 1999 Nov 1;5(6):193–6.

131. American College of Obstetricians and Gynecologists' Committee on Practice Bulletins—
Obstetrics. Practice Bulletin No. 165: Prevention and Management of Obstetric Lacerations
at Vaginal Delivery. *Obstet Gynecol.* 2016 Jul;128(1):e1–15.
132. Koelbl H, Nitti V, Baessler K, Salvatore S, Sultan A, Yamaguchi O. Pathophysiology of
Urinary Incontinence, Faecal Incontinence and Pelvic Organ Prolapse.
133. JBI Critical Appraisal Tools | JBI [Internet]. [cited 2023 Nov 14]. Available from:
<https://jbi.global/critical-appraisal-tools>
134. Cochrane Handbook for Systematic Reviews of Interventions [Internet]. [cited 2023 Jul 6].
Available from: <https://training.cochrane.org/handbook/current>
135. Baker WL, Michael White C, Cappelleri JC, Kluger J, Coleman CI, From the Health
Outcomes, Policy, and Economics (HOPE) Collaborative Group. Understanding
heterogeneity in meta-analysis: the role of meta-regression. *International Journal of Clinical
Practice.* 2009;63(10):1426–34.
136. Begg CB, Mazumdar M. Operating characteristics of a rank correlation test for publication
bias. *Biometrics.* 1994 Dec;50(4):1088–101.
137. Egger M, Smith GD, Schneider M, Minder C. Bias in meta-analysis detected by a simple,
graphical test. *BMJ.* 1997 Sep 13;315(7109):629–34.
138. Green JR, Soohoo SL. Factors Associated With Rectal Injury in Spontaneous Deliveries.
Obstetrics & Gynecology. 1989 May;73(5):732.

139. Combs CA, Robertson PA, Laros RK. Risk factors for third-degree and fourth-degree perineal lacerations in forceps and vacuum deliveries. *American Journal of Obstetrics & Gynecology*. 1990 Jul 1;163(1):100–4.
140. Guendelman S, Thornton D, Gould J, Hosang N. Obstetric complications during labor and delivery: assessing ethnic differences in California. *Womens Health Issues*. 2006;16(4):189–97.
141. Dua A, Whitworth M, Dugdale A, Hill S. Perineal length: norms in gravid women in the first stage of labour. *Int Urogynecol J*. 2009 Nov 1;20(11):1361–4.
142. Baghurst PA, Antoniou G. Risk Models for Benchmarking Severe Perineal Tears during Vaginal Childbirth: a Cross-sectional Study of Public Hospitals in South Australia, 2002–08. *Paediatric and Perinatal Epidemiology*. 2012;26(5):430–7.
143. Sentell T, Chang A, Cheng Y, Miyamura J. Maternal quality and safety outcomes for Asians and Pacific Islanders in Hawai‘i: an observational study from five years of statewide data. *BMC Pregnancy and Childbirth*. 2014 Aug 30;14(1):298.
144. Vathanan V, Ashokkumar O, McAree T. Obstetric anal sphincter injury risk reduction: a retrospective observational analysis. *J Perinat Med*. 2014 Nov;42(6):761–7.
145. Aiken CE, Aiken AR, Prentice A. Influence of the duration of the second stage of labor on the likelihood of obstetric anal sphincter injury. *Birth*. 2015 Mar;42(1):86–93.
146. Kapaya H, Hashim S, Jha S. OASI: a preventable injury? *Eur J Obstet Gynecol Reprod Biol*. 2015 Feb;185:9–12.

147. Durnea CM, Jaffery AE, Gauthaman N, Doumouchtsis SK. Effect of body mass index on the incidence of perineal trauma. *Int J Gynaecol Obstet*. 2018 May;141(2):166–70.
148. Ramm O, Woo VG, Hung YY, Chen HC, Ritterman Weintraub ML. Risk Factors for the Development of Obstetric Anal Sphincter Injuries in Modern Obstetric Practice. *Obstet Gynecol*. 2018 Feb;131(2):290–6.
149. Jardine JE, Knight HE, Carroll FE, Gurol-Urganci I. Risk of obstetric anal sphincter injury in women having a vaginal birth after a previous caesarean section: A population-based cohort study. *Eur J Obstet Gynecol Reprod Biol*. 2019 May;236:7–13.
150. Sentell T, Chang A, Ahn HJ, Miyamura J. Maternal language and adverse birth outcomes in a statewide analysis. *Women & Health*. 2016 Apr 2;56(3):257–80.
151. Clayborne EP, Martin DR, Goett RR, Chandrasekaran EB, McGreevy J. Diversity pipelines: The rationale to recruit and support minority physicians. *Journal of the American College of Emergency Physicians Open*. 2021;2(1):e12343.
152. Landry AM, Stevens J, Kelly SP, Sanchez LD, Fisher J. Under-represented minorities in emergency medicine. *J Emerg Med*. 2013 Jul;45(1):100–4.
153. Tervalon M, Murray-García J. Cultural Humility Versus Cultural Competence: A Critical Distinction in Defining Physician Training Outcomes in Multicultural Education. *Journal of Health Care for the Poor and Underserved*. 1998;9(2):117–25.
154. Metzl JM, Hansen H. Structural competency: Theorizing a new medical engagement with stigma and inequality. *Soc Sci Med*. 2014 Feb;103:126–33.

155. Han M, Goyal D, Lee J, Cho H, Kim A. Korean Immigrant Women's Postpartum Experiences in the United States. *MCN Am J Matern Child Nurs*. 2020;45(1):42–8.
156. Ta Park VM, Goyal D, Suen J, Win N, Tsoh JY. Chinese American Women's Experiences with Postpartum Depressive Symptoms and Mental Health Help-Seeking Behaviors. *MCN Am J Matern Child Nurs*. 2019;44(3):144–9.
157. The Meaning of Giving Birth: Voices of Hmong Women Living in... : The Journal of Perinatal & Neonatal Nursing [Internet]. [cited 2023 Jan 12]. Available from: https://journals-lww-com.libaccess.lib.mcmaster.ca/jpnnjournal/Fulltext/2017/07000/The_Meaning_of_Giving_Birth__Voices_of_Hmong_Women.7.aspx
158. Vo T. Southeast and East Asian immigrant women's transnational postpartum experiences: A meta-ethnography. *Journal of Clinical Nursing* [Internet]. [cited 2023 Jan 12];n/a(n/a). Available from: <https://onlinelibrary.wiley.com/doi/abs/10.1111/jocn.16037>
159. Behruzi R, Hatem M, Goulet L, Fraser W, Misago C. Understanding childbirth practices as an organizational cultural phenomenon: a conceptual framework. *BMC Pregnancy and Childbirth*. 2013 Nov 11;13(1):205.
160. Kang HK. Influence of Culture and Community Perceptions on Birth and Perinatal Care of Immigrant Women: Doulas' Perspective. *J Perinat Educ*. 2014;23(1):25–32.
161. Seo JY, Kim W, Dickerson SS. Korean immigrant women's lived experience of childbirth in the United States. *J Obstet Gynecol Neonatal Nurs*. 2014;43(3):305–17.

162. Pereira GMV, Pimentel VM, Surita FG, Silva AD, Brito LGO. Perceived racism or racial discrimination and the risk of adverse obstetric outcomes: a systematic review. *Sao Paulo Med J.* 2022;140(5):705–18.
163. Witherspoon DJ, Wooding S, Rogers AR, Marchani EE, Watkins WS, Batzer MA, et al. Genetic Similarities Within and Between Human Populations. *Genetics.* 2007 May;176(1):351–9.
164. Hui W. The Idea of Asia and Its Ambiguities. *The Journal of Asian Studies.* 2010 Nov;69(4):985–9.
165. Kassen M. Understanding foreign policy strategies of Kazakhstan: a case study of the landlocked and transcontinental country. *Cambridge Review of International Affairs.* 2018 Jul 4;31(3–4):314–43.
166. Associations Between Maternal Obesity and Race, with Obstetric Anal Sphincter Injury: A Retrospective Cohort Study - PMC [Internet]. [cited 2023 Jan 12]. Available from: <https://www.ncbi.nlm.nih-gov.libaccess.lib.mcmaster.ca/pmc/articles/PMC6333960/>
167. Callister LC, Vehvilainen-Julkunen K, Lauri S. Giving Birth: Perceptions of Finnish Childbearing Women. *MCN: The American Journal of Maternal/Child Nursing.* 2001 Feb;26(1):28.
168. Averbach S, Ha D, Meadows A, Brubaker L, Gyamfi-Bannerman C. Failure to progress: structural racism in women’s healthcare. *eClinicalMedicine* [Internet]. 2023 Mar 1 [cited 2023 Mar 2];57. Available from: [https://www.thelancet.com/journals/eclinm/article/PIIS2589-5370\(23\)00038-X/fulltext](https://www.thelancet.com/journals/eclinm/article/PIIS2589-5370(23)00038-X/fulltext)

169. Bae GM, Cho HS, Lee IS. The Review of Postpartum Care Beliefs and Practices According to the Cultures. *The Journal of Korean Obstetrics and Gynecology*. 2009;22(1):231–42.
170. Polubriaginof FCG, Ryan P, Salmasian H, Shapiro AW, Perotte A, Safford MM, et al. Challenges with quality of race and ethnicity data in observational databases. *J Am Med Inform Assoc*. 2019 Aug 1;26(8–9):730–6.
171. Atkins R. INSTRUMENTS MEASURING PERCEIVED RACISM/RACIAL DISCRIMINATION: REVIEW AND CRITIQUE OF FACTOR ANALYTIC TECHNIQUES. *Int J Health Serv*. 2014;44(4):711–34.

Appendix Material

Appendix Table 1. Scoping review search terms for the MEDLINE, OVID, Embase, Emcare and Cochrane databases

1	(Migrant* OR Immigrant* OR emigrant* OR newcomer* OR refugee* OR Permanent resident* OR asylum seek*).
2	(Race* OR cultur* OR ethnicit* OR raciali?ed* OR non-white* OR Asian* OR black* OR African American* OR Latin* OR indigenous OR indian* OR metis OR aborigin* OR inuit* OR amish OR jew* OR arab* OR polynesian* OR afro- caribbean* OR Afr* Canadian* OR hispanic OR caucasian*).
3	(Religio* OR Catholic* OR mormon* OR protestant* OR jehovahs witness* OR Christian* OR Islam* OR Hind* OR Sikh* OR Buddhis* OR jew* OR Muslim* OR Orthodox*).
4	(Obstetric trauma* OR Obstetric Anal Sphincter Injur* OR OASI* OR maternal trauma* OR anal incontinence* OR anal sphincter injur* OR anus sphincter* OR third-degree perineal laceration* OR fourth-degree perineal laceration* OR severe perineal laceration* OR sphincteroplast* OR perineal tear* OR fecal incontinence* OR flatal incontinence* OR obstetric injur* OR maternal injur*).
5	1 AND 4
6	(2 OR 3) AND 4

7	1 AND (2 OR 3) AND 4_
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Databases: Medline, OVID Global Health, Embase, Emcare, Cochrane Database of Systematic

Reviews (From 1910 to 2022)

Appendix Table 2. Systematic review search terms for the MEDLINE, OVID, Embase, Emcare and Cochrane databases

1	Asia* OR central asia* OR East* asia* OR South-East Asia* OR SouthEast Asia* OR South* Asia* OR West* Asia* OR Kazakh* OR Kyrgyz* OR Tajik* OR Turkmen* OR Uzbek* OR Chin* OR HongKong OR Maca* OR Korea* OR Mongolia* OR Japan* OR Brunei Darussalam* OR Cambodia* OR Indonesia* OR Lao* OR Malaysia* OR Myanmar* OR burm* OR Philippin* OR Singapor* OR Thai* OR Timor-Leste* OR Timorese* OR vietnam* OR Afghanistan* OR Bangladesh* OR Bhut* Sharchop* OR India* OR Iran* OR Maldiv* Dhivehin* OR nepal* OR pakistan* OR sri lanka* OR west* asia* OR Armenia* OR Azerbaijan* OR Bahrain* OR Cypr* OR Georgia* OR Iraq* OR israel* OR jordan* OR kuwait* OR leban* OR oman* OR qatar* OR saudia arabia* OR turk* OR Emirate* OR yemen*
2	Obstetric trauma* OR Obstetric Anal Sphincter Injur* OR third-degree perineal laceration* OR third degree perineal laceration* OR third-degree tear* OR third degree tear* OR third-degree laceration* OR third degree laceration* OR obstetric anal sphincter laceration* OR obstetric anal sphincter tear* OR fourth-degree tear* OR fourth degree tear* OR fourth-degree perineal laceration* OR fourth degree perineal laceration* OR severe perineal laceration* OR perineal tear* OR obstetric injur* OR perineal injur* OR perineum injur*
3	1 AND 2

Database: MEDLINE, OVID, Embase, Emcare and the Cochrane.

Appendix Table 3. PECO for systematic review

Criteria	Inclusion Category
Population	Individuals with vaginal delivery of a live or stillbirth in non-Asian, high-income countries
Exposure	Asian race/ethnicity were defined using the United Nations (UN) classification. Studies that aggregated individuals of Asian race with other racial groups were not included.
Comparators	Studies were included if they compared outcomes among Asian individuals with those in white individuals. The white population serves as a comparison group as they are the predominant ethnic group in non-Asian, high-income countries and because they are not affected by the institutional racism that underlies racial inequities in health. Studies that aggregated white individuals with other racial groups were excluded.
Outcome	Obstetric anal sphincter injury (3rd or 4th degree perineal laceration)

Appendix Table 4. Risk of bias assessment for cohort studies*

Study author, year	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Score
Combs et al, 1990(139)	Y	Y	Unclear	Y	Y	Y	Y	N/A	N/A	N/A	Y	7
Handa et al, 2001(57)	Y	Y	Unclear	Y	Y	Y	Y	N/A	N/A	N/A	Y	7
Goldberg et al, 2003(108)	Y	Y	Y	N	Y	Y	Y	N/A	N/A	N/A	N	6
Hopkins et al, 2005(109)	Y	Y	Y	Y	Y	Y	Y	N/A	N/A	N/A	Y	8
Guendelman et al, 2006(140)	Y	Y	N	Y	Y	Y	Y	N/A	N/A	N/A	Y	7
Dua et al, 2009(141)	Y	Y	Y	N	N	Y	Y	N/A	N/A	N/A	N	5
Schwartz et al, 2009(99)	Y	Y	Y	Y	Y	Y	Y	N/A	N/A	N/A	Y	8
Baghurst et al, 2012(142)	Y	Y	Unclear	Y	Y	Y	Y	N/A	N/A	N/A	Y	7
Tsai et al, 2012(96)	Y	Y	Unclear	Unclear	Y	Y	Y	N/A	N/A	N/A	Y	6
Gurol-Urganci et al, 2013(77)	Y	Y	Unclear	Y	Y	Y	Y	N/A	N/A	N/A	Y	7
deSilva et al, 2014(113)	Y	Y	Y	Y	Y	Y	Y	N/A	N/A	N/A	Y	8
Sentell et al, 2014(143)	Y	Y	Unclear	Y	Y	Y	Y	N/A	N/A	N/A	Y	7
Vathanan et al, 2014(144)	Y	Y	Unclear	Y	Y	Y	Y	N/A	N/A	N/A	Y	7
Aiken et al, 2015(145)	Y	Y	Unclear	Y	Y	Y	Y	N/A	N/A	N/A	Y	7
Grobman et al, 2015(115)	Y	Y	Unclear	Y	Y	Y	Y	N/A	N/A	N/A	Y	7
Yeaton-Massey et al, 2015(97)	Y	Y	Y	N	N	Y	Y	N/A	N/A	N/A	N	5
Durnea et al, 2018(147)	Y	Y	Y	Y	Y	Y	Y	N/A	N/A	N/A	Y	8
Ramm et al, 2018(148)	Y	Y	Y	Y	Y	Y	Y	N/A	N/A	N/A	Y	8
Jardine et al, 2019(149)	Y	Y	Unclear	Y	Y	Y	Y	N/A	N/A	N/A	Y	7

Williams et al, 2019(119)	Y	Y	Y	Y	Y	Y	Y	N/A	N/A	N/A	Y	8
Yamasato et al, 2019(98)	Y	Y	Y	Y	Y	Y	Y	N/A	N/A	N/A	Y	8
Albar et al, 2021(120)	Y	Y	Y	Y	Y	Y	Y	N/A	N/A	N/A	Y	8
Jardine et al, 2021(121)	Y	Y	Y	N	N	Y	Y	N/A	N/A	N/A	N	5
Zeng et al, 2021(122)	Y	Y	Y	Y	Y	Y	Y	N/A	N/A	N/A	Y	8

*List of question included in the Joanna-Briggs critical appraisal tools for cohort studies include the following 11 questions for which the answer may be Yes, No, Unclear, or Not Applicable (N/A).

Q1. Were the two groups similar and recruited from the same population?

Q2. Were the exposures measured similarly to assign people to both exposed and unexposed groups?

Q3. Was the exposure measured in a valid and reliable way?

Q4. Were confounding factors identified?

Q5. Were strategies to deal with confounding factors stated?

Q6. Were the groups/participants free of the outcome at the start of the study (or at the moment of exposure)?

Q7. Were the outcomes measured in a valid and reliable way?

Q8. Was the follow up time reported and sufficient to be long enough for outcomes to occur?

Q9. Was follow up complete, and if not, were the reasons to loss to follow up described and explored?

Q10. Were strategies to address incomplete follow up utilized?

Q11. Was appropriate statistical analysis used?

Appendix Table 5. Risk of bias assessment for case-control studies*

Study author, year	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Score
Kapaya et al, 2015(146)	Y	Y	Y	Unclear	Y	Y	Y	Y	N/A	Y	8
Schrot-Sanyan et al, 2021(100)	Y	Y	Y	Unclear	Y	Y	Y	Y	N/A	Y	8

*List of question included in the Joanna-Briggs critical appraisal tools for cohort studies include the following 10 questions for which the answer may be Yes, No, Unclear, or Not Applicable (N/A).

Q1 Were the groups comparable other than the presence of disease in cases or the absence of disease in controls?

Q2 Were cases and controls matched appropriately?

Q3 Were the same criteria used for identification of cases and controls?

Q4 Was exposure measured in a standard, valid and reliable way?

Q5 Was exposure measured in the same way for cases and controls?

Q6 Were confounding factors identified?

Q7 Were strategies to deal with confounding factors stated?

























Q8 Were outcomes assessed in a standard, valid and reliable way for cases and controls?

Q9 Was the exposure period of interest long enough to be meaningful?

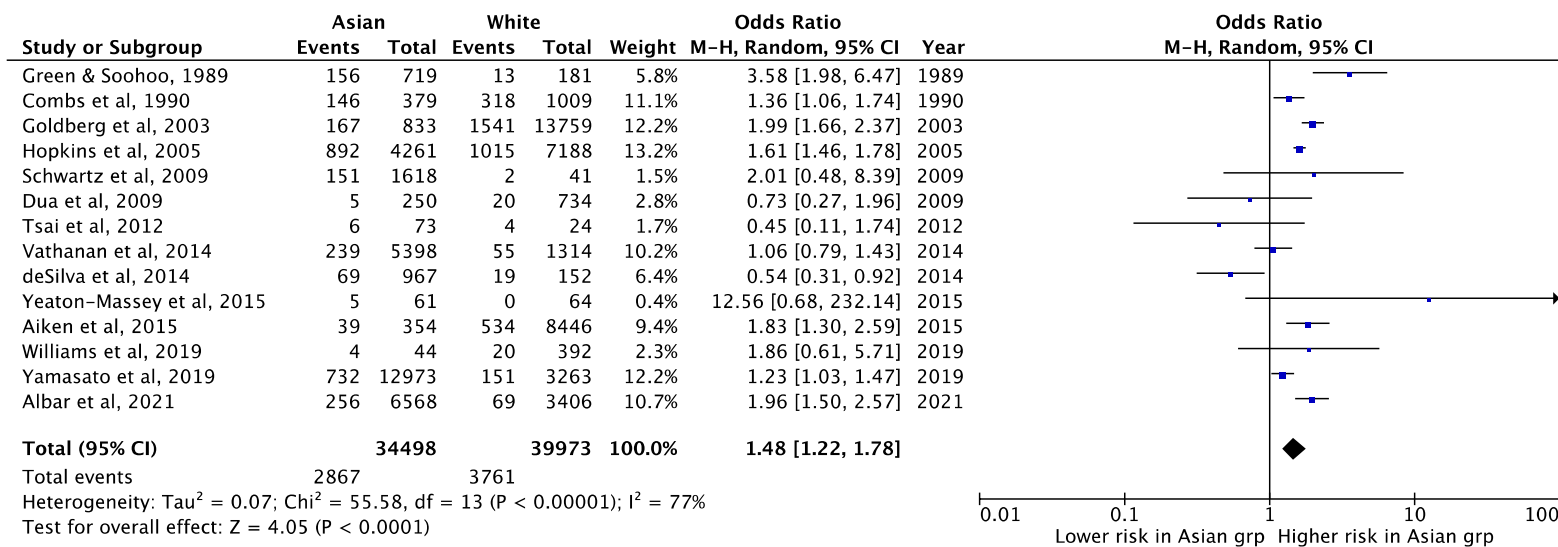
Q10 Was appropriate statistical analysis used?

Study author, year	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Score
Combs et al, 1990	●	●	●	●	●	●	●	●	●	●	●	7
Handa et al, 2001	●	●	●	●	●	●	●	●	●	●	●	7
Goldberg et al, 2003	●	●	●	●	●	●	●	●	●	●	●	6
Hopkins et al, 2005	●	●	●	●	●	●	●	●	●	●	●	8
Guendelman et al, 2006	●	●	●	●	●	●	●	●	●	●	●	7
Dua et al, 2009	●	●	●	●	●	●	●	●	●	●	●	5
Schwartz et al, 2009	●	●	●	●	●	●	●	●	●	●	●	8
Baghurst et al, 2012	●	●	●	●	●	●	●	●	●	●	●	7
Tsai et al, 2012	●	●	●	●	●	●	●	●	●	●	●	6
Gurol-Urganci et al, 2013	●	●	●	●	●	●	●	●	●	●	●	7
deSilva et al, 2014	●	●	●	●	●	●	●	●	●	●	●	8
Sentell et al, 2014	●	●	●	●	●	●	●	●	●	●	●	7
Vathanan et al, 2014	●	●	●	●	●	●	●	●	●	●	●	7
Aiken et al, 2015	●	●	●	●	●	●	●	●	●	●	●	7
Grobman et al, 2015	●	●	●	●	●	●	●	●	●	●	●	7
Yeaton-Massey et al, 2015	●	●	●	●	●	●	●	●	●	●	●	5
Durnea et al, 2018	●	●	●	●	●	●	●	●	●	●	●	8
Ramm et al, 2018	●	●	●	●	●	●	●	●	●	●	●	8
Jardine et al, 2019	●	●	●	●	●	●	●	●	●	●	●	7
Williams et al, 2019	●	●	●	●	●	●	●	●	●	●	●	8
Yamasato et al, 2019	●	●	●	●	●	●	●	●	●	●	●	8
Albar et al, 2021	●	●	●	●	●	●	●	●	●	●	●	8
Jardine et al, 2021	●	●	●	●	●	●	●	●	●	●	●	5
Zeng et al, 2021	●	●	●	●	●	●	●	●	●	●	●	8
● Yes												
● No												
● Unclear												
● N/A												

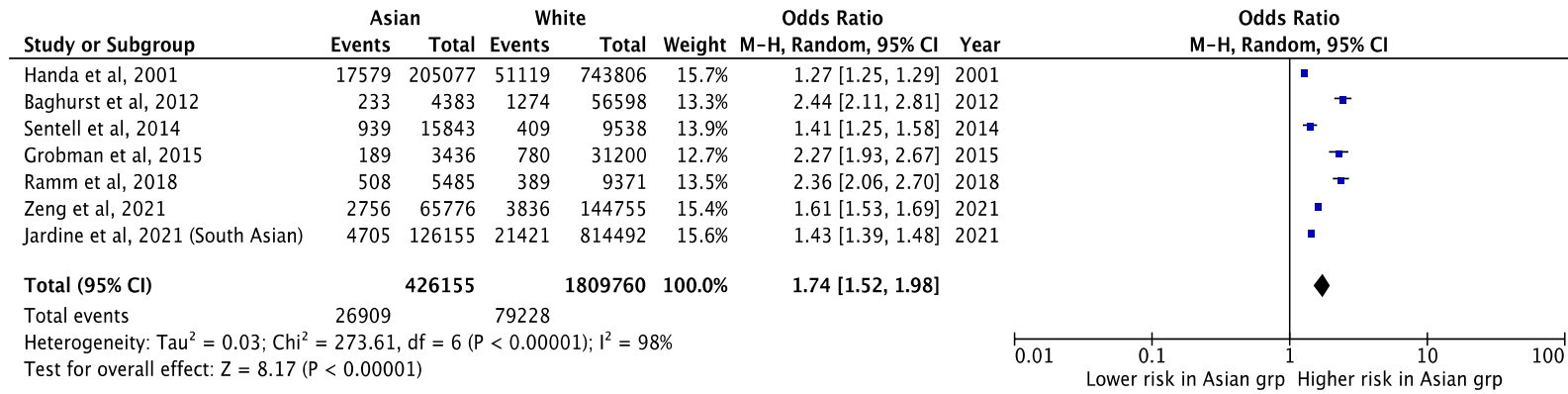
Appendix Figure 1. Risk of bias assessment traffic light display figure (Cohort studies)

Study author, year	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Score
Kapaya et al, 2015 ⁸⁶											8
Schrot-Sanyan et al, 2021 ⁵¹											8
 Yes											
 No											
 Unclear											
 N/A											

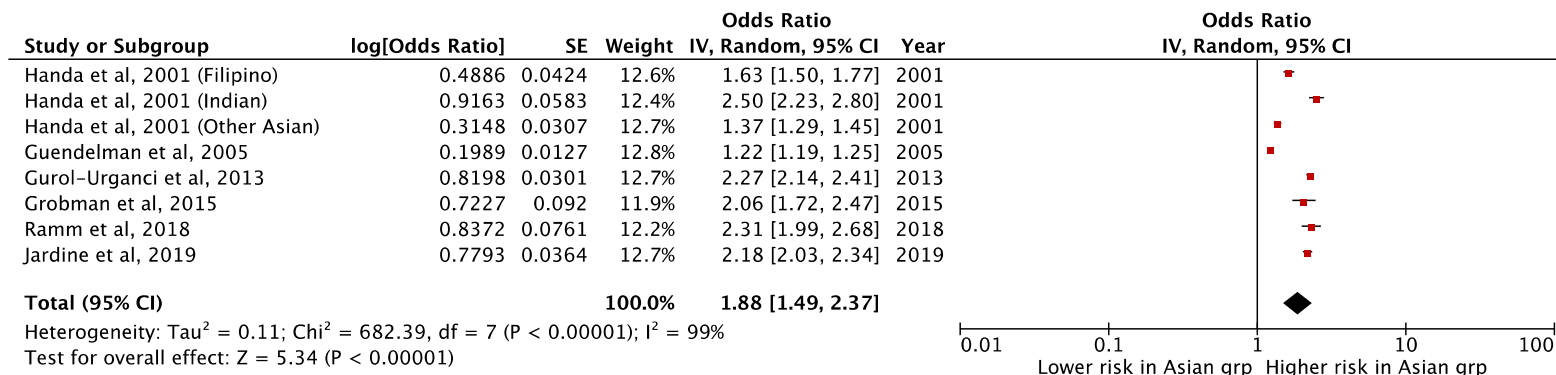
Appendix Figure 2. Risk of bias assessment traffic light display figure (Case-control studies)



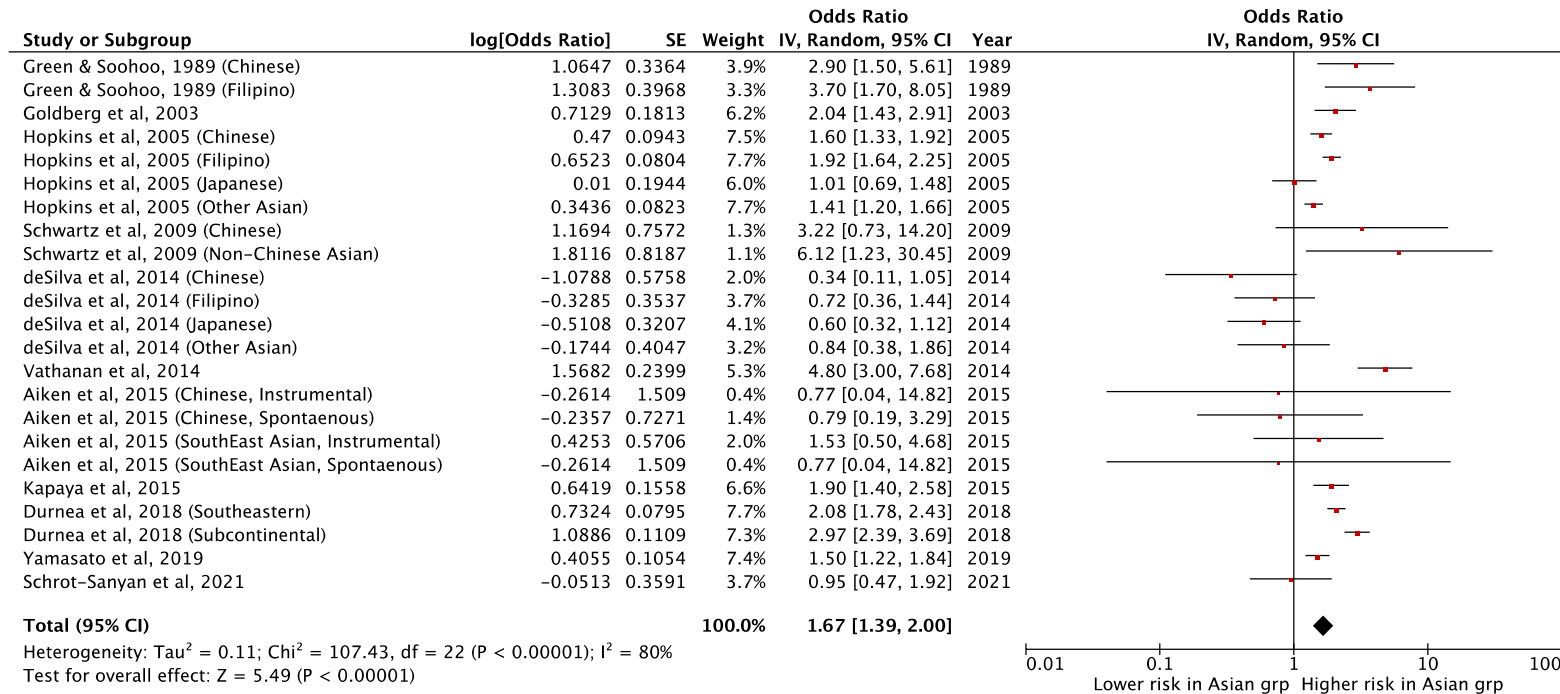
Appendix Figure 3. Meta-analysis of adjusted estimates of obstetric anal sphincter injury among Asian vs. white individuals, hospital-based studies



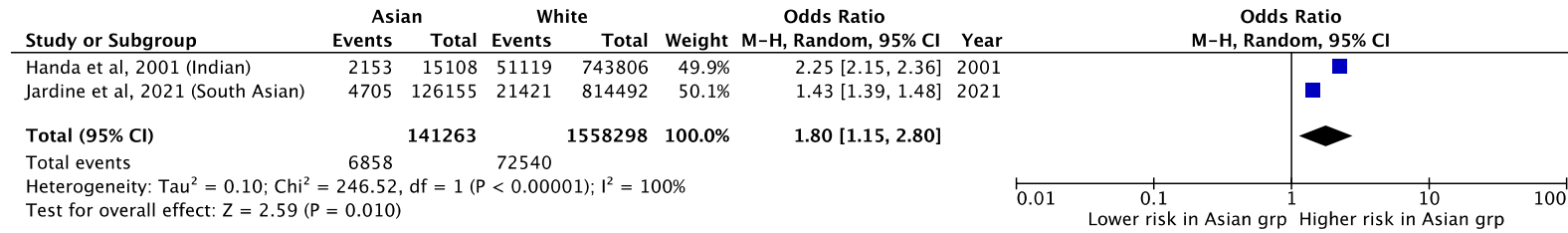
Appendix Figure 4. Meta-analysis of adjusted estimates of obstetric anal sphincter injury among Asian vs. white individuals, population-based studies



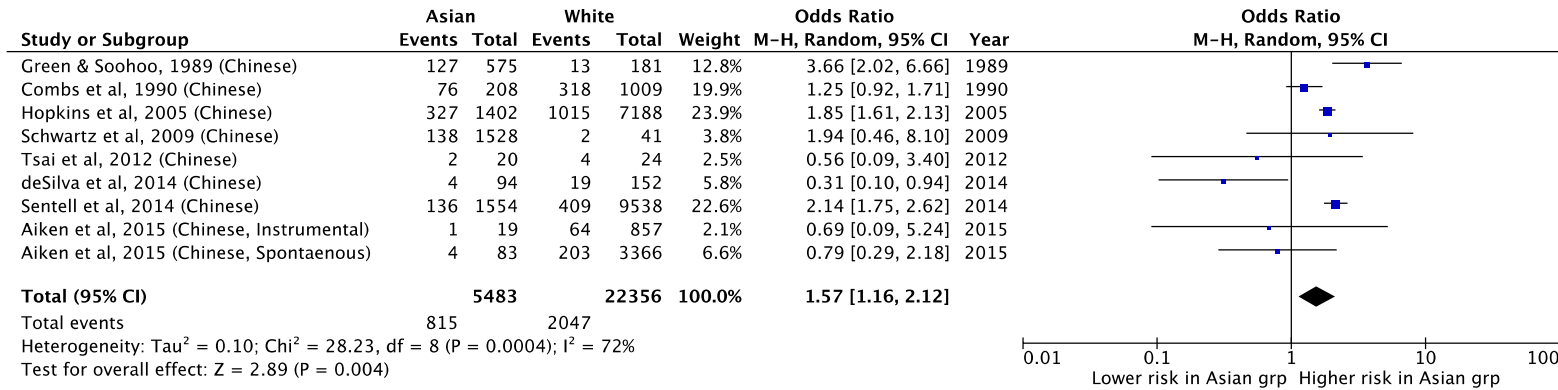
Appendix Figure 5. Odds ratios and 95% confidence intervals for obstetric anal sphincter injury (OASI) among studies of Asian vs. white individuals, stratified by population-based studies. Meta-analysis performed using the random effects inverse variance method.



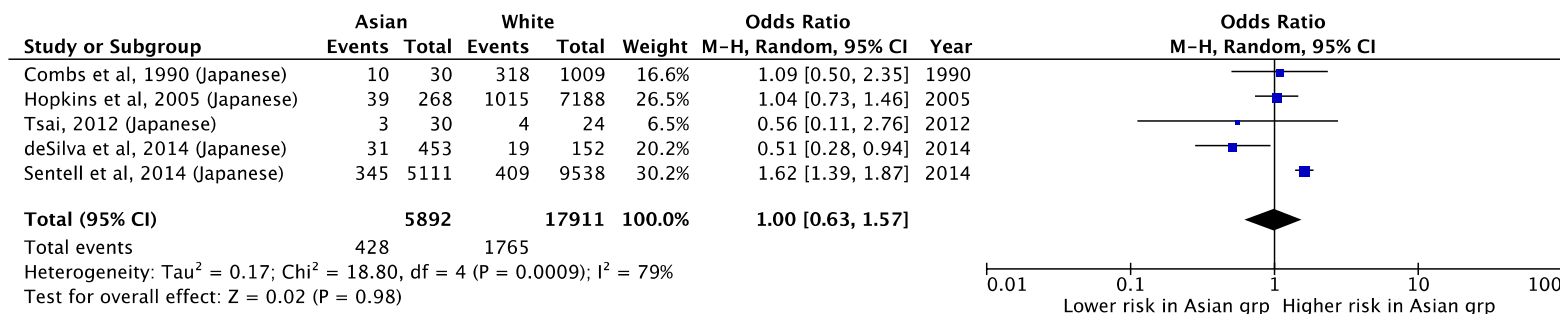
Appendix Figure 6. Odds ratios and 95% confidence intervals for obstetric anal sphincter injury (OASI) among studies of Asian vs. white individuals, stratified by hospital-based studies. Meta-analysis performed using the random effects inverse variance method.



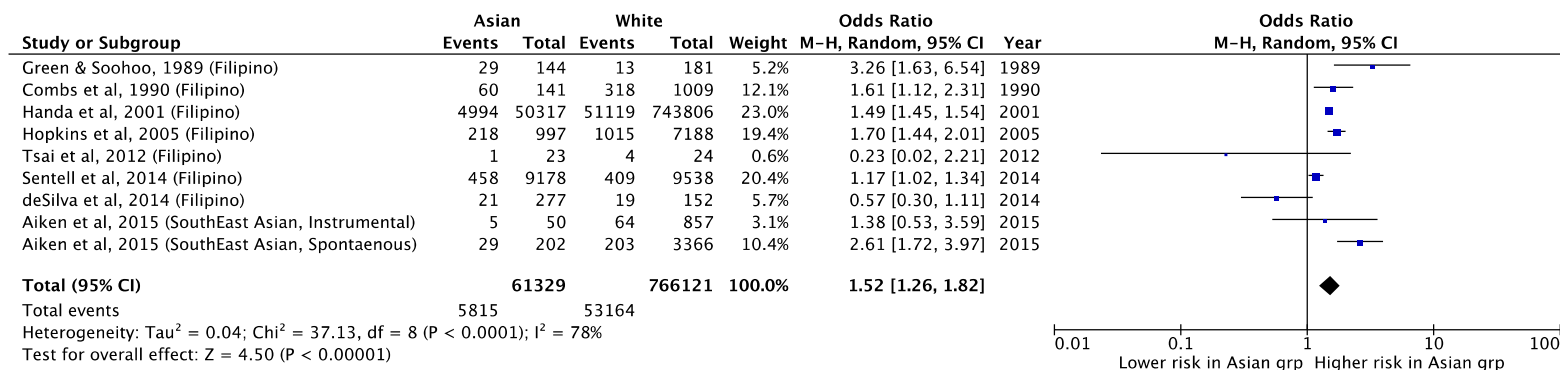
Appendix Figure 7. Odds ratios and 95% confidence intervals for obstetric anal sphincter injury (OASI) among studies of Asian vs. white individuals, stratified by reported subgroups of South Asian race/ethnicity



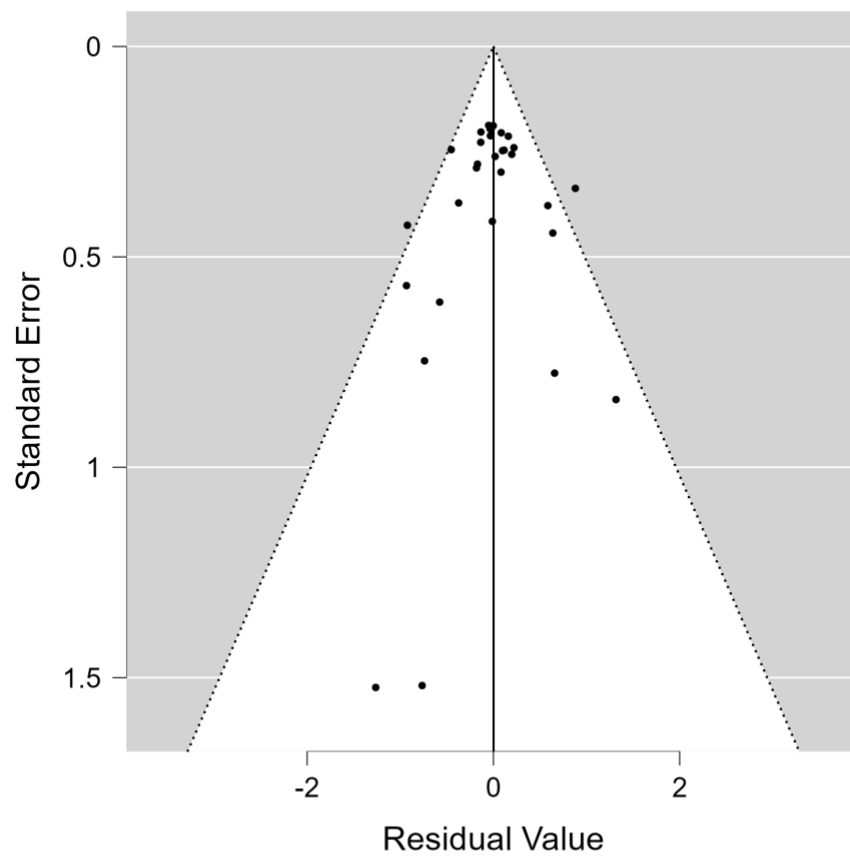
Appendix Figure 8. Odds ratios and 95% confidence intervals for obstetric anal sphincter injury (OASI) among studies of Asian vs. white individuals, stratified by reported subgroups of Chinese race/ethnicity



Appendix Figure 9. Odds ratios and 95% confidence intervals for obstetric anal sphincter injury (OASI) among studies of Asian vs. white individuals, stratified by reported subgroups of Japanese race/ethnicity



Appendix Figure 10. Odds ratios and 95% confidence intervals for obstetric anal sphincter injury (OASI) among studies of Asian vs. white individuals, stratified by reported subgroups of South-East Asian/Filipino race/ethnicity



Appendix Figure 11. Funnel plot to assess publication bias