

Systematic review

Night blindness and associated factors among pregnant women in Ethiopia: A systematic review and meta-analysis

Daniel Sisay W/tsadik^{*1}, Temesgen Leka Lerango¹, Bereket Bizuneh Bekele³, Getachew Asefa¹, Mesfin Abebe², Habtamu Endashaw Hareru¹, Yegeta Teshale Asfaw³, Solomon Hailemariam Tesfaye¹

¹School of Public Health, College of Health Sciences and Medicine, Dilla University, Dilla, Ethiopia

²Department of Midwifery, College of Health Sciences and Medicine, Dilla University, Dilla, Ethiopia

³School of Medicine, College of Health Sciences and Medicine, Dilla University, Dilla, Ethiopia

Corresponding authors*: danielsisay93@gmail.com

Abstract

Background: Night blindness is a significant public health problem among pregnant women in Ethiopia. This systematic review and meta-analysis aimed to estimate the pooled prevalence of night blindness and its associated factors among pregnant women in Ethiopia.

Methods: Studies were searched using electronic databases such as PubMed, Science Direct, and gray literature using Google scholar as well as manual search of reference list of previous studies to retrieve related articles. We used a total of Seven primary studies in our review. Quality of all eligible studies was checked using JBI critical appraisal assessment tool. Data extraction and analysis were performed using Microsoft excel-10 and STATA 17 software respectively. Heterogeneity and publication bias were checked using the I^2 statistic and Egger's test, respectively. Meta-analysis was carried out using random-effects model.

Results: The overall pooled prevalence of night blindness among pregnant women in Ethiopia was 19.32% (95% CI: 12.61-26.04). Subgroup analysis revealed that high prevalence of night blindness found in the Amhara region which was 21.41% (95% CI: 12.83-30.13), but lower prevalence found in the southern region which was 10% (95% CI: 4.23-15.77) and Meta-analysis using two primary studies revealed that those night blinding among age 35 and above have 3.02 (95% CI: 1.73-5.24) times higher risk of getting blind compared to those pregnant women age less than 25 years old.

Conclusion: The overall pooled prevalence of night blindness among pregnant women in Ethiopia was 19.32%. Pregnant women age greater than 35 years were significantly affected by night blindness. So, strengthening the multivitamin supplementation including vitamin A to reproductive age women is crucial and improving women's married during teenage is an important intervention to tackle maternal night blindness.

Keywords: Prevalence, Associated factors, Age, Night blindness, Ethiopia, Pregnant women

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Introduction

The inability to see normally after dark or at night while getting pregnant, particularly in the third trimester and postpartum is known as maternal night blindness. Night blindness is the most prevalent visual symptom of mild to moderate vitamin A deficiency. Rhodopsin, which is found in retinal receptors, allows us to see in low light (rods), as shown by the absence of late-dark adaptation or problems

(1,2). About 9.8 million Women worldwide are affected by night blindness, or 7.8% of the population at risk for Vitamin A Deficiency (VAD). In Southeast Asia (9.8%) and Africa (9.8%), more women (9.8%) are affected by night blindness. Each is thought to have an impact on over 3 million expectant mothers, or one-third of all affected women worldwide. Each year, it is estimated that more than 6 million pregnant women suffer from night blind-

ness. Public health priorities in 66 countries are moderate to severe night blindness prevalence. A cutoff point of 5% maternal night blindness prevalence is advised for the identification of VAD as a significant public health issue(3,4).

Women with night blindness are more likely to be both infectious (such as having urinary and genital infections, diarrhea, and dysentery) and non-contagious (such as preeclampsia and symptoms of anorexia, nausea, and vomiting (5, 6).

When there is VAD, pregnant women are among the most at risk for night blindness, and vitamin A is one of the micronutrients needed during pregnancy. Around the world, VAD is thought to affect 19 million pregnant women, and each year, more than 6 million of these women develop night blindness. Prevalence of night blindness in pregnant women is a moderate to serious public health concern in 66 countries. Over 3 million pregnant women in each region are affected by night blindness, which affects a comparable and significant percentage of pregnant women in South-East Asia (9.9%) and Africa (9.8%)(4,9). These are the problems Ethiopian expectant mothers are facing. On the other hand, the economy, the population, the weekly diet, the weekly history, and other risks have an impact on night vision (5,6). Night blindness, on the other hand, is affected by the economy and population, weekly nutrition, weekly history, and other risks(6,7).

An easy way to identify a vitamin A deficiency is to look at a family history of night vision during pregnancy. The dark-adapted threshold is a functional measure of vitamin A status and is closely related to serum retinol concentrations(8). The purpose of this systematic review and meta-analysis was to determine the pooled prevalence of night blindness and associated factors among Ethiopian pregnant women.

Methods

Identification and Study Selection

Google Scholar, PubMed/MEDLINE, and Science Direct were used as electronic databases. The search terms were (Prevalence OR Magnitude OR Epidemiology) AND (Night blindness) AND (Age greater than 35 years old) AND (among Ethiopian pregnant mothers). his systematic review and meta-analysis followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.

Eligibility criteria

Title and Abstracts of the searched results were reviewed based on the following inclusion and exclusion criteria:

Inclusion Criteria.

Research articles conducted among Ethiopian pregnant women were included

Cross-sectional study design

Literatures published in the English language

Studies conducted among Ethiopian pregnant women

Published articles between 2011 and 2019

Exclusion Criteria

If there were more than one paper that was extracted from one specific study

More complete reported data were considered from only one paper

Duplicate citations and non-relevant articles

Data Extraction

Two authors (D.S and H.E) independently extracted all the necessary data using a standardized data extraction format prepared in Microsoft Excel 16. Each paper was reviewed and selected by two reviewers (D.S and H.E). In data extraction format the first author, Study period, publication year, region, sample size, response rate, and prevalence of night blindness were included.

Outcome measurements

Our systematic review and meta-analysis had two main objectives. The first objective was to determine the pooled prevalence of night blindness among pregnant women in Ethiopia. The second objective was to estimate the pooled factors of night blindness.

Quality of the studies included in this review

Two authors (D.S and H.E) independently evaluated the qualities of the original articles using JBI critical appraisal assessment tool as a guideline. All of the studies were assessed with JBI critical appraisal checklist for cross-sectional studies.

Statistical Procedure

Important data were extracted using a Microsoft Excel format. After extraction, the data were imported to STATA version 17.0 (software) for analysis. The characteristics of original articles were described using texts, table, and forest plot. The standard error of prevalence for each original article was calculated using the binomial distribution formula. Heterogeneity among the reported prevalence of studies was checked using a heterogeneity χ^2 test and I^2 test. Publication bias was also examined by performing Egger's correlation and Begg's regression intercept tests at a 5% significant level.

Results

Literature search Results

In the first step of our search, 72 articles were retrieved systematically regarding the magnitude of night blindness among pregnant women in Ethiopia using electronic database such as Midline/PubMed, Google Scholar and Science Direct, and additional 15 records were identified through other sources. From the 72 articles, 41 articles were excluded due to duplication. Additionally, 23 articles were excluded after reviewing their titles, abstracts and full text in which we found

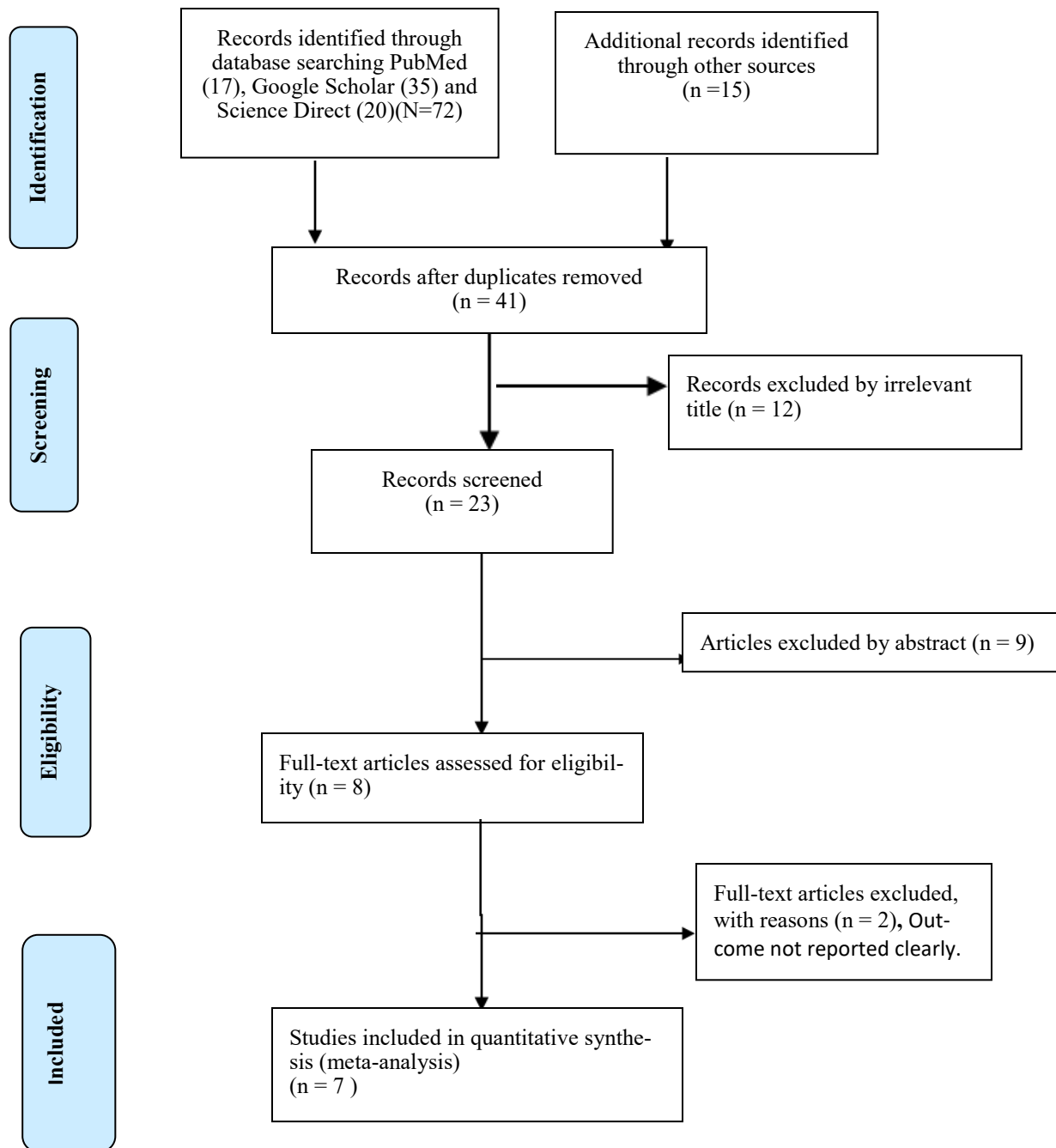


Figure 1: A PRISMA Flow chart explaining the selection of primary studies for systematic review and meta-analysis of magnitude of night blindness among pregnant mothers in Ethiopia (2022).

Original Article Characteristics

The summary of descriptive characteristics of Seven (7) primary studies included in this systematic review and meta-analysis is given in table 1. Searching and collecting of the studies in different region of the country were done from 2011 to 2020 in all regional states of Ethiopia. Seven articles were includ-

ed in the review with the sample sizes ranging from 104(10) to 742(3); whereas the lowest magnitude of night blindness was reported from SNNPR region [10% (95% CI: 4.23, 15.76)](10) and the highest in Amhara region [38.9%, (95% CI: 35.11- 42.76)](11) (Table 1).

Table 1: Summary of the magnitude of night blindness among pregnant mothers in Ethiopia included in the systematic review and meta-analysis (2022).

Region	First author	Publication year	Sample size	Response rate	Prevalence(95% CI)	Quality (JBI)
Tigray	Oumer Seid	2015	323	100	17.3(13.17-21.42)	Low risk
Amhara	Abebaw Baytekus	2019	742	98.4	13.7(11.20-16.19)	Low risk
SNNPR	Hiwot Abebe	2014	104	100	10(4.23-15.76)	Low risk
Amhara	Kibrom Legese	2012	480	97.9	18.6(15.08-22.11)	Low risk
Amhara	Melaku Tadege	2019	251	94.36	17.9(13.15-22.64)	Low risk
Amhara	Andargachew Mulu	2011	423	100	18.4(14.70-22.09)	Low risk
Amhara	Addisalem Damtie	2020	624	98.89	38.9(35.11- 42.76)	Low risk

Meta-Analysis

The forest plot shows the results of total primary studies included in our review. The pooled prevalence of night blindness among pregnant women in Ethiopia was 19.32% (95% CI: 12.61-26.04). Heterogeneity was seen across the studies detected by I^2 statistic ($I^2 = 95.5\%$, p value=0.000). Therefore, a random effects model was used to estimate the pooled prevalence of night blindness among pregnant women in Ethiopia.

With regard to publication bias, Begg's and Egger's tests were checked, and no significant publication bias was observed as evidenced by $p = 0.764$ and $P = 0.780$, respectively (Figure 2).

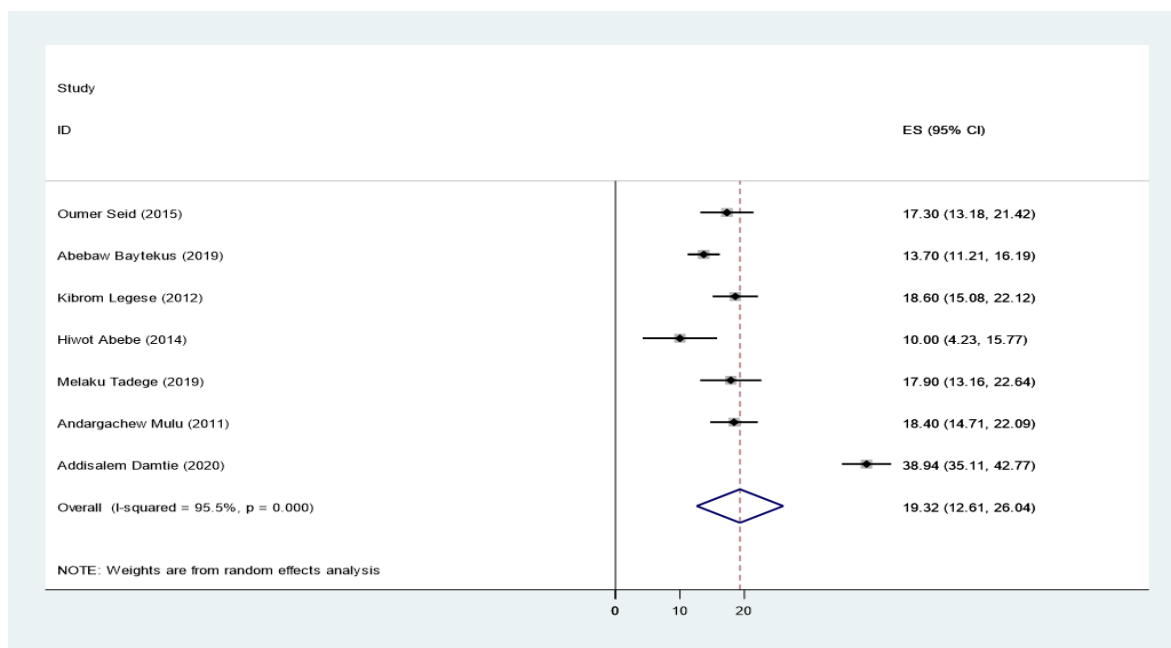


Figure 2: Forest plot for the pooled prevalence of night blindness among pregnant women in Ethiopia (2022).

Subgroup Analysis

We did a subgroup analysis based on the region for the meta-analysis. The studies were grouped based on the region. The highest (21.41%) prevalence of night

blindness was in Amhara region (95%CI: 12-83-30.13), and the lowest (10%) was in the southern region(95%CI:4.23-15.77)(Figure 3).

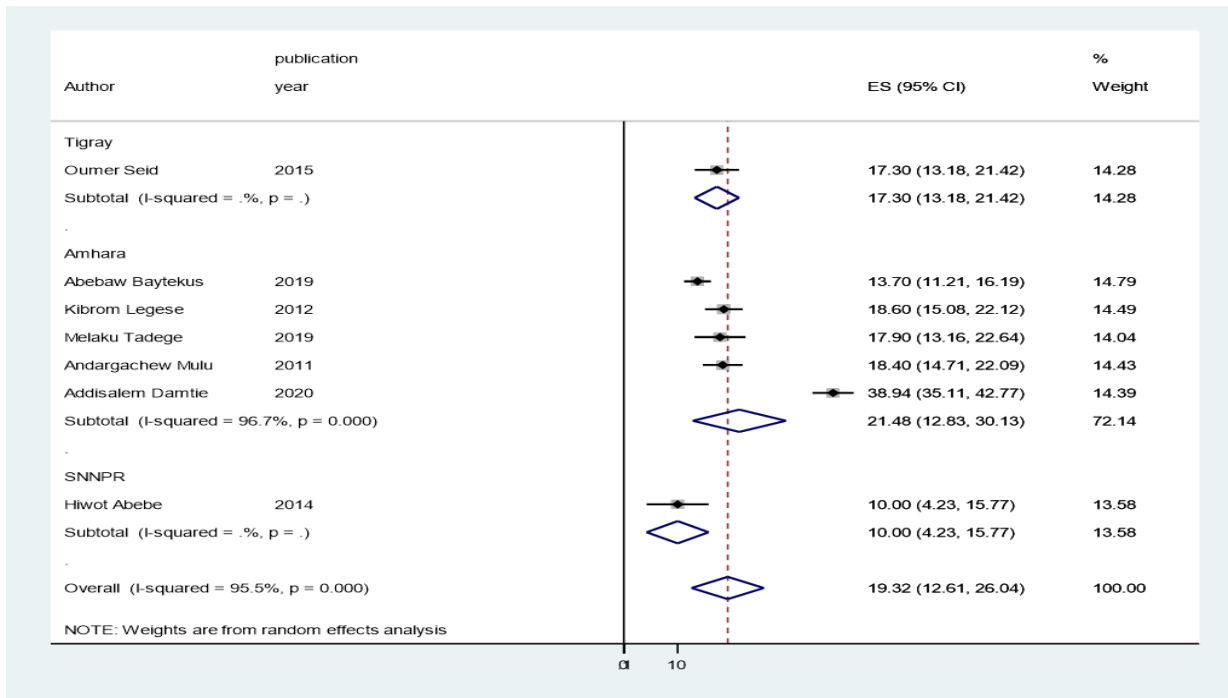


Figure 3: Forest plot for subgroup analysis by region of the studies of magnitude of night blindness among pregnant women in Ethiopia (2022).

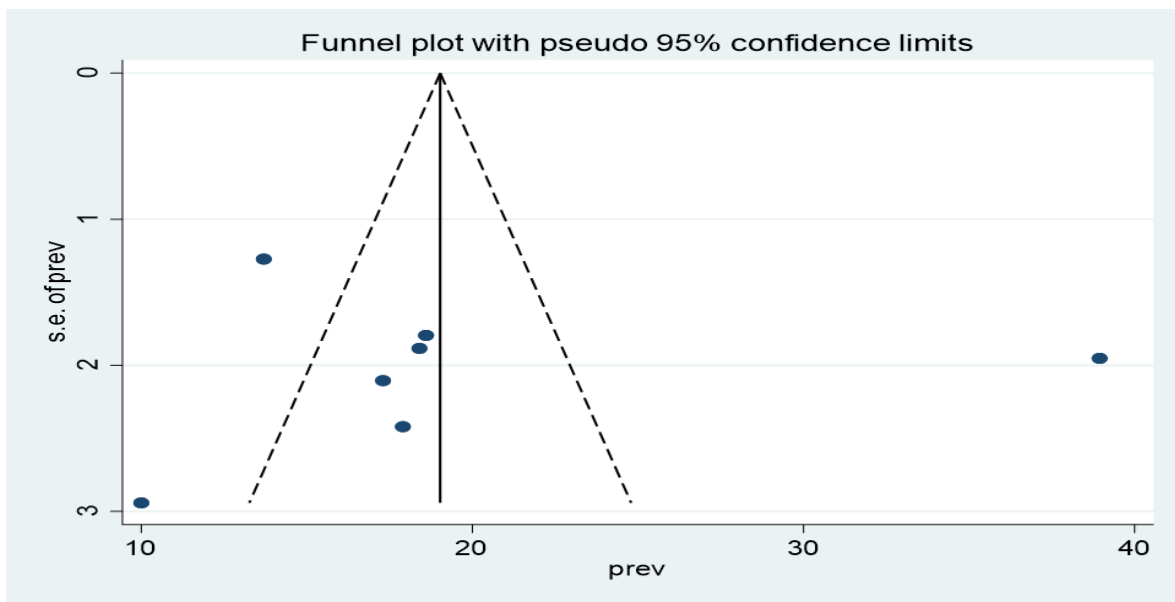


Figure 4: funnel plot for the pooled magnitude of night blindness among pregnant women in Ethiopia (2020).

Association of night blindness and pregnant women's age

In this study, we have examined the association between night blindness and age of pregnant women.

Meta-analysis using two primary studies revealed that night blindness was 3.02(95% CI:1.73-5.24) higher among age 35 and above than age less than 25 years old(Figure 4).

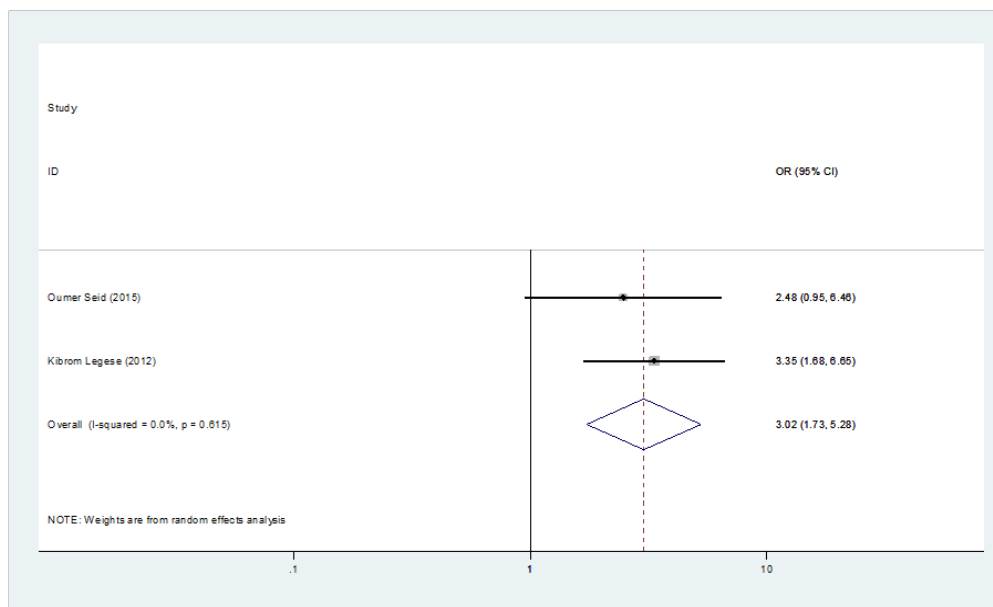


Figure 5: Forest plot showing the association of night blindness and age of pregnant women in Ethiopia (2022).

Discussion

Maternal night blindness is common during pregnancy in many developing countries. Globally, night blindness affects 9.8 million women which is 7.8% of the population at risk of VAD. A comparable and high proportion of women affected by night blindness are in Africa (9.8%) and South-East Asia (9.9%), estimated to have over 3 million pregnant women each affected, or one third of the women affected globally(4,9,12).

In the first step of our search, 72 articles were retrieved systematically regarding the prevalence of night blindness among pregnant mothers in Ethiopia using electronic database such as Midline/ PubMed, Google Scholar and Science Direct. From the 72 articles, 41 were excluded due to duplication. Additionally, 27 articles were excluded after reviewing their titles, abstracts and full text found non-relevant to our review. Only 8 articles were found to be eligible and included in analysis.

This systematic review and meta-analysis used seven studies to determine the pooled prevalence of night blindness among pregnant women in Ethiopia, which was 19.32% [12.61-26.04]. This prevalence is above three times the cut of point of public health importance of World Health Organization

definition of night blindness (night blindness cut of point $\geq 5\%$)(6).

The prevalence of night blindness was consistent with that of a study conducted in the Republic of Congo (16%) (13), Pakistan(16.2%)(14), Bangladesh (37%) (15) and Nepal (21%)(16). However, our result was higher than that of the study conducted in West Pacific (5%)(17). The possible explanation for the variations might be due to differences in study settings. This means, some studies were conducted in urban communities among well informed participants. Differences in study periods might also affect the Vitamin A status of pregnant women, and The study conducted in rural Terai Nepal showed lower prevalence of night blindness (7%) among pregnant & lactating women to the present study(18).

This might be due partly to implementation of treatment for vitamin A deficiency, and A study conducted in rural South India indicated that the prevalence of night blindness during pregnancy (5.2%) among women at delivery (19). This might be attributed to the large sample size used in the study.

The subgroup analysis of this study also showed that the prevalence of blindness varies across regions in

Ethiopia. The highest prevalence of night blindness was seen in people living in Amhara region which was 21.48% (95%CI: 12.83-30.13) but lower prevalence was found in the Southern region was 10 % (95%,CI:4.23-15.77).

In our study pregnant woman age greater than 35 years old were 4.5 times night blinded than below 25 years old of their counterpart, and the risk of developing night blindness increases with age. The result of this study is in agreement with that of a study conducted in Nepal which also reported that pregnant women age over 30 years had highest risk for night blindness than those who are below this age range (18). This may be due to depletion of the stores of the body vitamin A associated with frequent pregnancies and giving birth and/or due to frequent pregnancies induced iron deficiency anemia which affects hepatic retinol metabolism.

Conclusion

The overall pooled prevalence of night blindness among pregnant mothers in Ethiopia was 19.32%. Pregnant women age greater than 35 years were significantly affected by night blindness. So, strengthening the multivitamin supplementation including vitamin A to reproductive age women is crucial and improving women's married during teenage is an important intervention to tackle maternal night blindness.

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Declaration

Ethical approval

Not applicable because of this study was done using secondary data not primary data

Consent for publication

Not applicable.

Availability of data and materials

The data sets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

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There is no grant from any funding agency.

Authors' Contributions

DS and HE conceived the idea and had major roles in the data review, extraction, and analysis. All authors (TL,MA,YT,GA,BB and SH) contributed to the analysis, writing, drafting, and editing. All the authors read and gave approval of the final version to be published and agreed to be equally accountable for all aspects of the work.

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Competing interest

The authors declare that there are no conflicts of interest.

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