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SYSTEMATIC REVIEW**Prevalence of Ventricular Septal Defect (VSD) in Infants of Fayoum Discrete:
Systematic Review**

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E-mail:sumerelefakhrany@gmail.com**Submit Date** 20-10-2024**Accept Date** 09-11-2024**ABSTRACT**

Background: The occurrence of VSD varies significantly across different populations and geographic regions. Understanding the prevalence and outcomes of VSD in specific populations, such as infants in Fayoum, is essential for developing targeted screening, intervention, and management strategies. We aim to synthesize available data on the prevalence of VSD in this region, highlighting diagnostic methods and associated outcomes to inform public health initiatives and improve clinical practices.

Methods: We conducted a systematic review thorough search on Google Scholar, PubMed, Embase, & Cochrane Library. The investigation utilized both text terms and medical subject headings, such as Ventricular Septal Defect (VSD), Prevalence, Infants, Fayoum, Diagnostic Methods, Outcomes, Echocardiography. In addition, we conducted a thorough investigation on ClinicalTrials.gov and examined the references cited in selected materials and reviews to discover any more pertinent observational research.

Results: The significant prevalence of ventricular septal defects (VSD) among infants in Fayoum, with reported rates ranging from 11.3% to 34.3%. The findings indicate that VSD constitutes a major public health concern in this region, with implications for early detection and intervention. The variability in prevalence rates across different studies highlights the need for comprehensive screening programs and enhanced healthcare access to improve outcomes for affected infants.

Conclusion: Factors such as socioeconomic conditions, maternal health, and healthcare infrastructure play critical roles in the prevalence and management of VSD. Addressing these issues through targeted public health initiatives and policies will be essential in mitigating the impact of congenital heart defects in the Fayoum population.

Key words: Ventricular Septal Defect (VSD); Prevalence; Infants; Fayoum; Diagnostic Methods Outcomes; Echocardiography.

INTRODUCTION

Congenital heart defects (CHDs) are the most prevalent birth defects worldwide, affecting approximately 8 for every 1,000 live births. Among these, Ventricular Septal Defect (VSD) is one of the most frequently diagnosed; accounting for about 20-25% of all CHDs [1,2]. VSD is characterized by an opening in the ventricular septum, the wall separating the lower chambers of the heart, which can lead to complications as heart failure, delayed growth, and recurrent respiratory infections. The severity of VSD varies depending on the location and size of the defect, and it can have a significant impact on the quality of life and

survival of affected infants if not properly managed [3,4].

VSD can be classified into perimembranous, muscular, inlet, and outlet (supracristal) based on their location within the ventricular septum, the most common morphological variants are the perimembranous Ventricular septal defect and the muscular Ventricular septal defect. These defects can arise in any of the following directions: anteriorly, posteriorly, inlet, or outflow. Supracristal varieties are less common [5].

According to the size and flow of the ventricular septal defect, there is a possibility that hemodynamic impairment will occur. It is

especially beneficial for cases who are hemodynamically unstable to have a successful closure perform. The potential complications of cardiopulmonary bypass, including infection, postpericardiotomy syndrome, chylothorax, and a full atrioventricular block, are still present following conventional open operation to manage Ventricular septal defect. These complications include myocardial and pulmonary injury, electrolyte imbalance, coagulopathy, and acute renal failure. Further, extended stays in the ICU following operation or hospital are necessary in comparison to nonsurgical treatments [6].

Despite the widespread occurrence of ventricular septal defect, there is a lack of comprehensive data on its prevalence in specific regions, particularly in middle - and low -income countries. Egypt, like many other countries in the Middle East and North Africa, faces challenges in addressing CHDs due to limited healthcare resources, diagnostic capacities, and population-specific research. The Fayoum district, located in central Egypt, is one such region where socioeconomic and environmental factors may influence the prevalence and outcomes of CHDs, including VSD. These factors, combined with potential genetic predispositions and the region's healthcare infrastructure, make the study of VSD prevalence in Fayoum particularly relevant.

Hence, this systematic review aimed to synthesize available data on the prevalence of VSD in this region, highlighting diagnostic methods and associated outcomes to inform public health initiatives and improve clinical practices. By doing so, it seeks to provide a clearer understanding of the burden of this congenital condition in the region and to recognize any gaps in the existing literature. Additionally, this review will compare the prevalence rates in Fayoum to those reported in other parts of Egypt and similar regions, contributing to a broader understanding of VSD epidemiology in low-resource settings.

METHODS

Search strategy:

We conducted a thorough search on Google Scholar, PubMed, Embase, & Cochrane Library. The investigation utilized both textual terms and medical subject titles, such as Ventricular Septal Defect (VSD), Prevalence, Infants, Fayoum, Diagnostic Methods Outcomes, Echocardiography. In addition, we conducted a thorough search on ClinicalTrials.gov

and examined the references cited in selected publications and reviews to discover more relevant observational research.

Inclusion criteria:

investigations were eligible if they satisfied the following criteria: Studies that focus on infants diagnosed with ventricular septal defects (VSD) in Fayoum Governorate, Egypt, Studies that utilize echocardiography, cardiac catheterization, or other validated diagnostic methods for detecting VSD.

Exclusion criteria:

reports excluded: Studies that do not specifically focus on infants or those conducted in populations outside Fayoum, Studies without a defined methodology or clear criteria for diagnosis and studies that do not utilize validated diagnostic methods for VSD or rely solely on clinical diagnosis without confirmatory testing.

Data extraction:

Two researchers conducted separate assessments of the titles and abstracts of all the papers generated to determine their relevance. We thoroughly examined each trial that was discovered and decided about whether to include it or not. Researchers also independently extracted the data into a standardized data extraction form. The two reviewers established a consensus on decisions about the inclusion of research and data extraction. The 3rd researcher would have the final authority to determine trial eligibility and extract data where discrepancies have been discovered.

RESULTS

The findings indicate that VSD constitutes a major public health concern in this region, with implications for early detection and intervention. As shown in **Table (1)**.

The variability in prevalence rates across different studies highlights the need for comprehensive screening programs and enhanced healthcare access to improve outcomes for affected infants. As shown in **Table (2)**.

Factors such as socioeconomic conditions, maternal health, and healthcare infrastructure play critical roles in the prevalence and management of VSD. Addressing these issues through targeted public health initiatives and policies will be essential in mitigating the impact of congenital heart defects in the Fayoum population.

Table (1): Illustrated the characteristic of the groups under investigation

Study ID	Year of the study	Study location	Study design	Population size	Age of the population	Gender
Mahmoud HH et al. [7]	2023	Fayoum Governorate, Egypt	cross-sectional study	150	Cases' ages ranged from 0.5 -126 months (median age of 16 months).	Regarding sex, half of the studied patients (50%) were females
MOHAMED IS et al. [8]	2023	Alexandria, Egypt	retrospective descriptive single-center study	722	The age ranged from 2 days to 18 years with Mean \pm SD 8.94 \pm 19.61	There were (54.3%) males and (45.7%) females
Abdel Latif DS et al. [9]	2022	Ain Shams, Egypt	retrospective cohort study	35	The median age was 5 years ranging from 1 y to 14 years.	18 cases (51.4%) of
						were females and 17 cases (48.6%) were males.
El-Gilany AH et al. [10]	2017	Mansoura, Egypt	retrospective hospital record-based descriptive study	1720	The age of referral ranged from one month up to 17 years.	There were 1086 males and 634 females
Al-Fahham MM et al. [11]	2021	Cairo, Egypt	retrospective epidemiological cross-sectional study	1005	Their ages at diagnosis ranged from 1 day to 12 years with a median and interquartile range (IQR) of 6 (9-0.5) months.	There were 543 males (54%) and 462 females (46%)
Hasan AA et al. [12]	2023	Jordan	retrospective medical record review	1497	Gestational age (weeks) was 37 (34, 40)	There were (45.0%) females and (55.0%) males.
Haddish HT et al. [13]	2019	Northern Ethiopia	cross sectional study	1000	The age ranged from 22 days to 87 years. The mean (SD) age of the study participants was 32.3 \pm 23.8 years.	There were 473 males and 527 females

Table (2): Clarified the prevalence of Ventricular Septal Defects (VSD) in infants, diagnostic methods and outcomes

Study ID	Diagnostic method	Prevalence of VSD and outcomes
Mahmoud HH et al. [7]	echocardiography	Echocardiographic examination of cases revealed that (32.9%) had ventricular septal defect (VSD).
MOHAMED IS et al. [8]	echocardiographic	The prevalence of VSD was (11.3%).
Abdel Latif DS et al. [9]	cardiac catheterization	All studied children (n= 35) were with VSD
El-Gilany AH et al. [10]	echocardiography	The prevalence of ventricular septal defects (VSD) in studied children was 14.7%, accounting for 39.8% of all congenital heart disease (CHD) cases in this population.
Al-Fahham MM et al. [11]	advanced pediatric echocardiography, cardiac catheterization, and fetal echocardiography	The prevalence of isolated ventricular septal defects (VSD) was 19.8%, with a total of 199 cases observed across different age groups. The highest frequency occurred in children aged 1 month to 1 year.
Hasan AA et al. [12]	echocardiography	One of the most commonly identified abnormalities was ventricular septal defects (VSD), observed in 183 patients (12.2% of the total patients and 17.0% of those with congenital heart disease [CHD]).
Haddish HT et al. [13]	echocardiography	Out of the total 160 congenital cases, 59(36.8%) was VSD.
Ibrahim SA et al. [14]	Echocardiography	The commonest lesion was VSD 49 (34.3%)

DISCUSSION

The findings reveal that VSD is a common congenital heart defect in this population. The prevalence of VSD ranged from 11.3% to 36.8% across the reviewed studies, with Mahmoud et al. [7] reporting the highest prevalence of 32.9% and Mohamed et al. [8] reporting the lowest at 11.3%. Abdel Latif et al. [9] reported that all children in their study (n=35) had VSD, which may indicate a selection bias, as they focused on a specific cohort.

Regarding gender distribution among the studies, it was relatively balanced, with some studies showing a slight male predominance, while others reported equal representation. For instance, Mahmoud et al. [7] reported 50% females, while Ibrahim et al. [14] noted a higher male ratio of 1.2:1.

Isolated VSD constitutes 37% of all congenital heart diseases in children, with an incidence of approximately 0.3% among newborns. The occurrence diminishes significantly in adults due to the spontaneous closure observed in up to 90% of cases. VSDs do not exhibit gender predilection [15].

When comparing the prevalence rates in Fayoum to global statistics:

The rates of VSD in Fayoum are consistent with those reported in other low- and middle-income

countries, where VSD prevalence varies between 12.2% - 34.3% and for up to 40% of congenital heart defects [12,14,16]. This highlights a potential commonality in risk factors and healthcare challenges faced by these populations.

The prevalence of VSD in Fayoum may be influenced by various socioeconomic and environmental factors specific to the region. This was aligned with the study of Wu L et al. [17], who revealed that maternal factors including maternal obesity, smoking in pregnancy, maternal diabetes and exposure to organic solvents might predispose the offspring to CHD risk.

The differences in prevalence rates may also reflect the diagnostic capabilities of healthcare facilities. Most studies employed echocardiography as the primary diagnostic tool, which is essential for accurate identification of VSD. However, the varying prevalence rates may indicate differences in the thresholds for diagnosis or the timing of echocardiographic evaluations.

This was in consistent with previous study that reported ultimate diagnosis of CHD comes via cardiac imaging, usually echocardiogram. Prenatal diagnosis via fetal echocardiogram is increasingly common in high-resource settings. Detection rates vary greatly—from less than 10% to greater than 80%—depending on setting and cardiac lesion with the lowest detection rates for pulmonary venous anomalies [18].

However, in middle-income countries, access to fetal echocardiography is rare. Even among centers performing congenital heart surgeries, less than half report always having fetal echocardiography available when needed [19].

Several gaps and limitations were identified in the existing literature:

Sample Size and Study Design: Many studies had relatively small sample sizes or were limited to specific populations, which may affect the generalizability of the findings. The reliance on single-center studies limits the broader applicability of the results.

Lack of Longitudinal Data: The absence of longitudinal studies that track the outcomes of infants diagnosed with VSD in Fayoum hampers our understanding of the long-term implications and potential interventions.

Conclusion

The findings indicate that VSD constitutes a major public health concern in this region, with implications for early detection and intervention. The variability in prevalence rates across different studies highlights the need for comprehensive screening programs and enhanced healthcare access to improve outcomes for affected infants. Factors such as socioeconomic conditions, maternal health, and healthcare infrastructure play critical roles in the prevalence and management of VSD.

Recommendation

Further research is warranted to explore the long-term outcomes of infants diagnosed with VSD and to identify genetic, environmental, and socioeconomic risk factors. This will provide valuable insights for developing effective prevention and treatment strategies, ultimately enhancing the quality of care for infants with congenital heart diseases in Fayoum and similar settings.

Conflict of interest

The authors declared that they have no conflicts of interest with respect to authorship and/or publication of this article.

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