Preventive measures for Acute Rheumatic Fever/Rheumatic Heart Disease

A Literature Review

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Abstract:
Acute rheumatic disease is a major burden in the developing countries and also a major cause of premature death in children and young adults every year. **Aim**: The aim of this study is to investigate the factors contributing to prevention of acute rheumatic fever and rheumatic heart disease in developing countries. This will offers appropriate knowledge to the care provider to identify risk factors for acute rheumatic fever and implement interventions timely. The research questions are following: (1) What kinds of issues are important in prevention of ARF/RHD? (2) What general guideline focused on prevention of ARF/RHD exist? **Method**: The qualitative literature review research methodology was used in the study to explore the previous literature and deliver an overall image about the latest issues and guidelines for prevention of acute rheumatic fever and rheumatic heart disease. Materials were collected mainly from electronic database: Academic search Elite (EBSCO), PubMed, CINAHL (EBSCO), and Google Scholar. The Newman's theory was used as theoretical framework. **Result**: The risk factors of ARF/RHD are poor socioeconomic, environmental and behavioral conditions. A challenge also was lack of awareness among population regarding the condition and prevalence of streptococcal infection. **Conclusion**: Improving knowledge regarding the disease between health care provider and community people could help to achieve a good outcome of preventive strategies.

Keywords:	Rheumatic fever, rheumatic heart disease, prevention, prevalence, guideline, incidence, epidemiology
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FOREWORD

We would like to thank Arcada University of Applied Sciences for providing us a wonderful experience with lots of professional teachers and classmates including various learning method and materials.

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ABBREVIATIONS

PADet – Professional Alliance For Development

ARF – Acute Rheumatic Fever

RHD – Rheumatic Heart Disease

GAS – Group A Streptococcus

GABHS – Group A β −Hemolytic Streptococci

HLA - Human Leukocyte Antigen

RADT – Rapid Antigen Detection Testing

RTI – Respiratory Tract Infection

URTI – Upper Respiratory Tract Infection

BPG – Benzathine Penicillin G

MBL– Mannose Binding Lectin

WHO – World Health Organization

AV – Atrioventricular

CCF – Congestive Cardiac Failure

CHF – Congestive Heart Disease

ASO – Antistreptolysin O

CVD – Cardio Vascular Disease

1. INTRODUCTION

Acute rheumatic fever (ARF) and its sequelae rheumatic heart disease (RHD) are the major health issues, which affect children between 5-15 years of age mainly in developing countries as well as in aboriginal population of developed countries. [23]

This study is a part of the Arcada project called Professional Alliance For Development (PADet), which is an indigenous, not for profit, non-governmental humanitarian organization. PADet has three priority areas: sexual and reproductive health, HIV/AIDS prevention and care, and food security. Since 1998 the organization has worked in these areas and has now grown into a well-established, supportive local non-governmental humanitarian organization. [40]

PADet has worked together with different international organizations through the years, and established a partnership with Arcada –University of Applied Sciences in Finland in 2011.

The authors worked equally to formulate this thesis work, Shrestha Usha focused mainly on new research of preventive measures and Kunwar Nabina on guidelines.

1.1. Motivation to choice of research topic

The motivation for the choice of this topic is the authors, whose field of interest is the cardiovascular system and problems related to this system and it makes more enthusiastic to learn more about the cardiac problems. When the authors worked in a cardiac center, they saw lots of patients with cardiac problems. Among all cardiac problems, they found RHD as the most common disease in developing countries.

The cases of ARF have declined in most developed countries. Many physicians have little or no practical experience with the diagnosis and management of this condition. ARF is associated with damage valve tissue within the heart. RHD can lead to a chronic condition and consequently to congestive heart failure (CHF), stroke, endocarditis and

death. Although, since early 1900's ARF and RHD have been decreasing in developed countries, they continue to be a major cause of mortality among young people in developing countries. It was estimated all over the world over 15 million cases of RHD with new cases 282,000 and death 233,000 annually. [31]

1.2. Research aim and questions

The aim of this study is to investigate the factors contributing to prevention of acute rheumatic fever and rheumatic heart disease in developing countries, which is one leading cause of life threating cardiovascular diseases in most developing countries.

The following research questions will help to reach the aim of the study.

1. What kinds of issues are important in prevention of ARF/RHD?
2. What general guidelines focused on prevention of ARF/RHD exist?

2. BACKGROUND

In past, ARF causes morbidity and mortality, which makes significant health concerns especially in the developing countries. RHD is a major and the primary cause for acquired valvular disease worldwide. The most and common symptom that comes first is arthritis. Cardiac involvement may include valvulitis, myocarditis, and pericarditis. Chorea occurs in some patients. Most of the physicians use the 1992 update of Jones criteria to make the diagnosis. Treatment should be given to the patients with the unique set of symptoms. The primary and secondary prophylaxis focuses on the current prevention effort. [34]

Due to the lack of resources for providing quality healthcare, inadequate expertise healthcare providers and a low level of awareness in the society, influence the expression of the disease in the community. In developing countries, more than half of the patients have ARF but they are not aware of those conditions due to lack of resources. To

protect further attacks, long-term prophylactic antibiotic therapy is required for chronic RHD. [13]

In Nepal, 0.34% of admitted cases among all hospitals were sufferings from RHD. The incidence of RHD among school children is resorted as 1.35 per 10,000 in rural community of the hill region and 1.2 per 1000 in Kathmandu city. [30]

RHD has become rare in most countries because of ARF and its chronic sequelae, but still remains unchecked in developing and poor countries. According to the research, mainly in North America and Europe, ARF and RHD are improved and observed closely. However, some traditional views need to be improved or updated in view of the epidemiological shift of the past 50 years is still to be established, and improved data from developing countries are needed. Among populations with a high incidence of ARF, most of the doctors are adapting existing diagnostic guidelines to increase their sensitivity. New approaches to primary prevention are given the limitations of primary prophylaxis as a population-based strategy. The most effective approach for control of ARF/RHD is secondary prophylaxis, which is best delivered as part of a coordinated control programme. [32]

One of the notable part of the total heart disease is RHD. In the survey of 1994, it was estimated that 12 million individuals suffered from ARF/RHD worldwide. According to the World Health Organization (WHO) expert consultation on ARF/RHD, children and young adults in their most productive year are the ones with the most catastrophic effects of ARF/RHD. The individual with RHD requires cardiac valve surgery within 5-10 years. The mortality rate of RHD varies from 0.5 per 100,000 populations in Denmark, 8.2 per 100,000 populations in China and the estimated annual number of deaths from RHD in 2000 was 332,000 worldwide. The overall mortality rate per 100,000 populations varied from 1.8 in the WHO region of the America, to 7.6 in WHO South East Asian region. The annual incidence of RHD in developed countries began to decrease in 20th century, with an apparent decrease after the 1950's, which is now below 1.0 per 100,000 populations. Certain studies conducted in developing countries stated that the incidence rates ranging from '1.0 per 100,000 school age children Costa Rica', '72.2 per 100,000 in French Polynesia', '100 per 100,000 in Sweden', and '150 per 100,000 in

China'. Since, hospitals data are the single available data in many developing countries, and the morbidity data often given are with biased information about magnitude of disease, and with such data accounts for 12% - 65% of hospital admissions related to cardiovascular disease. [14]

2.1. Introduction to disease

This section contains the detailed information about the acute rheumatic fever (ARF) and rheumatic heart disease (RHD).

2.1.1. Definition and Etiology

ARF is a result of an autoimmune response to infection with group A streptococcus. Though, the morbidity and some mortality are significantly due to acute illness. And also the long-term damage to heart valves i.e. RHD, which arises after the major clinical and public health effects. [22]

ARF and RHD are a diffuse inflammatory disease, which is a delayed response of an infection by group A beta-hemolytic streptococcus. Although ARF and RHD are rare in developed countries, the incidence ratio of these diseases is still high in developing countries. In many parts in the world, RHD is still the leading cause of death from heart disease in the 5-24 years of age group. [14]

2.1.2. Risk Factor

Acute rheumatic fever develops in only relatively small percentage of clients after even a virulent bout of streptococcal infection. Therefore, there are some evidences of host predisposition. The link between incidence of disease and genetic have been studied with no clear correlation. [22] Once clients acquire ARF, they become more susceptible to a recurrent infection than the general population. In unprivileged areas, poor hygiene and overcrowding are risk factors for ARF infection. Probably, improving socioeconomic conditions is the most effective measures against ARF infection and mostly important is to prevent acute rheumatic fever. In the affluent regions of western world cities where there is spacious housing and non-crowding, there is also low incidence of

ARF. Nevertheless, it is of-course quite important to treat streptococcal infections with an adequate antimicrobial regimen. [15]

2.1.3. Pathophysiology

Usually, the pathogenesis of rheumatic heart disease starts after a throat infection resulting from an immune response consisting of humoral and cellular components, which is due to exposure to streptococcus pyogenes. "Antigenic mimicry in association with an abnormal host immune response is the cornerstone of pathophysiology, based on the triad of rheumatogenic group A streptococcal strain, genetically susceptible host, and aberrant host immune response. Streptococcus pyogenes contains M, T, and R surface proteins, which are all associated with bacterial adherence to throat epithelial cells. The role of autoimmune reactions in the pathogenesis of acute rheumatic fever was substantiated when antibodies against group A streptococcus reacted with human heart preparations. After binding to the antigenic peptide, the particular human leukocyte antigen (HLA) complexes can initiate inappropriate T-cell activation. Molecular mimicry takes place between streptococcal M-protein and several cardiac proteins and different patterns of T-cell antigen cross-recognition have been identified. Mannose binding lectin (MBL) is an acute-phase inflammatory protein that functions as a soluble pathogen recognition receptor. MBL binds to wide range of sugars on the surface of pathogens and plays a major part in innate immunity because of its ability to opsonize pathogens, enhancing their phagocytosis and activating the complement cascade via the lectin pathway." [22]

Diffusive, proliferative, and exudative inflammatory processes are produce by ARF. There is involvement of the heart, joints, subcutaneous tissues, central nervous system and skin in ARF. Although the exact pathogenesis is not clear, it is probably due to an abnormal humoral and cell-mediated response to streptococcal cell-membrane antigens. These antigen binds to receptors in the heart, tissues, and joints; thus begins the autoimmune response. The inflammatory process often produces permanent and severe heart damage, which may also cause death. [14]

2.1.4. Clinical Manifestations

Acute rheumatic fever mostly follows a streptococcal infection of the naso-pharynx.

Major manifestations usually include: -

- **Arthritis:** Arthritis, a prominent finding, is usually very painful and migratory. It often affects the larger joints, such as ankles, knees, elbows, shoulders and wrists. The arthritis may or may not be symmetric. If aspirin is taken early in the course of the disease, these symptoms may not be as apparent. Joint symptoms may last hours or days.
- **Carditis:** Carditis is one of the most common manifestations of the acute rheumatic fever, and has the most destructive consequences. Characteristics include a significant friction rub, and congestive heart failure (CHF) and many more. Chest pain may be present due to pericardial inflammation and sometimes there is also myocardial involvement that produces atrioventricular (AV) conduction defects or atrial fibrillation.
- **Subcutaneous Nodules:** Subcutaneous nodules are usually small, painless, firm nodules that adhere loosely to the tendon sheaths (especially in knees, knuckles and elbows). They are usually distinct only during the first week or so of the disease and only in children.
- **Erythema Marginatum:** Erythema marginatum is unusual rash that is seen primarily on the trunk. The lesions are crescent-shaped and have clear centers, also the rash is transitory and may change its appearance in a minutes or hours.
- **Chorea:** Chorea (Sydenham chorea, St. Vitus dance) is a kind of disorder related to the central nervous system, which is manifested by sudden, irregular, aimless, involuntary movements. The chorea may disappear without treatment and has no permanent sequelae. [23]

Minor manifestations usually include: -

- Fever, Abdominal pain, Weakness, Malaise, Weight loss and Anorexia. [23]

2.1.5. Diagnosis and Investigations

There is no definite test available to diagnose acute rheumatic fever. However, Jones criteria and WHO guideline assesses to diagnose and helps to minimize over diagnose.

Considering different management protocol world widely, the Indian academy of paediatric had formulated diagnostic guidelines in the management of acute rheumatic fever, which illustrates as follows:

i. "First episode: Two major or one major and two minor criteria plus supportive evidence of previous streptococcal throat infection.
ii. Recurrence in a patient without established heart disease: Two major or one major and two minor criteria plus supportive evidence of previous streptococcal throat infection.
iii. Recurrence in a patient with established heart disease: Two minor criteria plus supportive evidence of previous streptococcal throat infection.
iv. Indicators of recurrence of acute rheumatic fever in established heart disease:
    - New murmur / change in pre-existing murmur.
    - Pericardial rub / other evidence of pericarditis.
    - Unexplained congestive cardiac failure (CCF) including cardiomegaly.
v. Rheumatic chorea and insidious onset carditis: No need for any major criteria or supportive evidence of streptococcal throat infection.
vi. Recurrence: A new episode of ARF following an episode of GABHS occurring after 8 weeks following stopping treatment.
vii. Rebound: Manifestations of ARF occurring within 4-6 weeks of stopping therapy or while tapering medications.
viii. Relapse: Worsening of ARF while under treatment often with carditis.
ix. Subclinical carditis: Clinical examination is normal with abnormal echocardiogram: 30% of patients with chorea present with subclinical carditis.
x. Indolent carditis: Patients present with persistent features cardiomegaly, congestive heart failure (CHF) and murmurs with no/ few features of carditis." [23]

Investigation includes complete blood count, an erythrocyte sedimentation rate, a C-reactive protein, a throat culture, rapid streptococcal antigen test, and anti-streptolysin O

test (ASO), chest x-ray, electrocardiogram and also echocardiogram is compulsory to identify of subclinical carditis. [20, 23]

2.1.6. Preventive measures or strategies

Preventive strategies for the acute rheumatic fever are the most tempting choice for continual disease control in developing countries. And the symptomatic relief is also most important before entering to treatment strategies, which includes all the definite diagnosis management. Medical mediation prevents the initial attack of acute rheumatic fever or disease relapse, which is located on the eradication of group A streptococcus with Penicillin. [22]

The well establishment of antibiotic prophylaxis and total eradication of advanced rheumatic heart disease could be achieved with combination of broader changes e.g. improved living condition, education and awareness. [22]

The prevention strategies of ARF/RHD on many countries are attempted in various levels. Primordial and primary prevention aims is to stop a disease to occur within the first place, whereas secondary and tertiary prevention aims is to limit the development and decrease the consequences of the established disease. [15]

2.1.6.1. Primordial prevention

Community based prevention is to eliminate risk factor within the community. It is based on the socio-economic development, which directly affects hygiene, access to medical care and living condition. Before starting of antibiotic era, the developed nations has achieved decline in ARF incidence, which has been associated to improved living conditions in the USA and Western Europe. However, only improvement in economic condition does not give full protection against ARF and RHD, as reported in USA and northern Italy. [22]

According to Australian guideline (2012), “Primordial prevention is known as preventing the acquisition of GAS infection in context of ARF/RHD through implementing actions and measures that target environmental, economic, social and behavioral condi-

tions, cultural patterns of living that are known to increase the risk factor of such infections". [15] The aim of the primordial prevention is to control or decrease the development of risk factors to end up as ARF/RHD in an elevated risk population through implementation of various non-pharmacological actions, which helps to reduce the occurrence of ARF/ RHD. [15]

Primordial prevention was categorized mainly into two parts that are health education as prevention and health personnel training.

i. Health education as prevention

The purpose of health education is to positively influence the health behavior of individuals and communities as well as the living and working conditions that influence their health. Health education is a social science that draws from the biological, environmental, psychological, physical and medical sciences to promote health and prevent disease, disability and premature death through education-driven voluntary behavior change activities. Health education is the development of individual, group, institutional, community and systemic strategies to improve health knowledge, attitudes, skills and behavior. Health education activities are really important for the prevention of diseases. These activities should address both secondary and primary prevention. These activities are organized by trained doctors, nurses and teacher and taught to the public to prevent. These activities focus on the importance of recognizing and reporting especially sore throats to minimize and avoid the spread of infection and the treatment of sore throats properly, effectively and the importance of complying with prescribed treatment regimes. [14]

Health education activities are provided in schools, colleges and communities effectively communicate the health message and for increasing awareness. Health education is a part of teamwork to create an environment in which students feel empowered to make healthy choices and create a caring community. Electronic media plays a vital role to give the message and information to the public how to prevent such kind of diseases. The commitment of the school and school health services to the health education of

children is of tremendous importance when implementing ARF/RHD control programmes. [14]

ii. Health personnel training

Preventing ARF/RHD programmes require that all the members of the health teams have clearly identified roles and responsibilities and for this prevention they received appropriate training at regular intervals. Training should be given to the all physician as well as non-physician health care providers who are involved in secondary and primary prevention activities. In developing countries public health nurses are essential for running ARF/RHD preventing programmes especially in planning, coordinating and implementing such programmes where there are limited doctors. Training courses also includes procedures for penicillin skin testing and for treating anaphylactic reactions. Training programs should stress the importance of detection, diagnosis and appropriate treatment of streptococcal pharyngitis as well as detecting ARF/RHD and monitoring compliance to secondary prophylaxis. Health education improves the health status of individuals, families, communities, states, and the nation. Health education enhances the quality of life for all people. Health education reduces premature deaths. By focusing on prevention, health education reduces the costs that individuals, employers, families, insurance companies, medical facilities, communities, the state and the nation would spend on medical treatment. [14]

2.1.6.2. Primary prevention

According to WHO (2004), "The primary prevention of rheumatic fever is defined as the adequate antibiotic therapy of group A streptococcal upper respiratory tract infections (URTI) to prevent an initial attack of acute ARF. Primary prevention is administered only when there is group A streptococcal URTI. The therapy is therefore intermittent, in contrast to the therapy used for the secondary prevention of ARF, where antibiotics are administered continuously." [14]

Although, for primary prevention the eradication of group A streptococcal carriage could be accomplished through sore throat screening and treatment of pharyngitis by oral antibiotics or intramuscular antibiotic. Moreover, still primary prevention in large-

scale strategy has been neglected in the developing countries so; the targeted sub-population with high prevalence of rheumatic heart disease might be fruitful and efficient than present practice. [22]

Primary prevention concludes that the risk factor for ARF and RHD, especially the existence of GAS infection is present in a given population. Primary prevention treatment should target populations with high risk. According to author, the hypothesis applied as GAS is present in all populations, both rich and poor, and those with and without high rates of ARF/RHD. [15]

2.1.6.3. Secondary prevention

According to WHO (2004), "Secondary prevention of rheumatic fever is defined as the continuous administration of specific antibiotics to patients with a previous attack of ARF, or a well-documented RHD. The purpose is to prevent colonization or infection of the cocci and the development of recurrent attacks of ARF. Secondary prophylaxis is mandatory for all patients who have had an attack of ARF, whether or not they have residual rheumatic valvular heart disease." [14]

Secondary prevention pursuit to decrease the recurrent chronic ARF attacks by new group A streptococcal strains. Researchers prefer intramuscular injection of antibiotics therapy every 3-4 weeks after a chronic ARF attack rather than oral therapy, because it is proven adequacy and conformity of intramuscular injection. "The duration of secondary prophylaxis depends on the patients age, the date of their last attack, the most importantly the presence and severity of rheumatic heart disease." [22] Some institution has suggested for long term or lifelong antibiotic therapy, while the risk of relapse is high in highly endemic region. [22]

Secondary prophylaxis could not be delivered effectively within the community if the programme is not registered and due to poor setting issues has occurred in several programmes. "Education use of health workers with strong local community links, and in-

tegration into existing primary care networks are paramount to improve the efficiency of community based secondary prevention programmes." [22]

Table 1. International recommendation for secondary prophylaxis of ARF. (Marijon et al., 2012)

	Intramuscular Benzathine benzyl penicillin dose by patient weight	Interval of Benzathine benzyl penicillin injections	Oral alternative treatments (dose)	Duration
WHO, 2001	<30 kg: 6000 000 IU: ≥30 kg: 1200 000 IU	21 days if high risk; 28 days if low risk	Phenoxymethyl penicillin (250 mg twice a day); Sulphonamide (<30 kg: 500 mg daily; ≥30 kg: 1000 mg daily); Erythromycin (250 mg twice a day)	No carditis: for 5 years or until 18 years of age*; resolved carditis: for 10 years or until at least 25 years of age*; moderate to severe RHD or surgery: lifelong
Australia, 2006	<20 kg: 600 000 IU; ≥20 kg: 1200 000 IU	28 days; 21 days if high risk	Phenoxymethylpenicillin (250 mg twice a day); Erythromycin (250 mag twice a day)	No carditis: for 10 years or until 21 years of age*; resolved carditis or mild RHD: for 10 years or until 21 years of age*; moderate RHD: until 35 years of age; severe RHD or surgery: until at least 40 years of age
India, 2008	<27 kg: 600 000 IU; ≥27 kg: 1200 000 IU	15 days if < 27 kg; 21 days if ≥27 kg	Phenoxymethylpenicillin (250 mg twice a day in children; 500 mg twice a day in adults); Erythromycin (20 mg/kg; maximum dose 500 mg)	No carditis: for 5 years or until 18 years of age*; mild to moderate carditis or healed carditis: for 10 years or until 25 years of age*; sever RHD or post intervention: lifelong or until 40 years of age
USA, 2009	<27 kg: 600 000 IU; ≥27 kg: 1200 000 IU	28 days; 21 days if having recurrent attacks	Phenoxymethylpenicillin (250 mg twice a day); Sulphonamide (<27 kg: 500 mg daily; ≥27 kg 1000 mg daily); Macrolide (dose variable)	No carditis: for 5 years or until 21 years of age*; resolves carditis: for 10 years or until 21 years of age*; RHD: for 10 years or until 40 years of age*; consider lifelong if high risk

3. THEORETICAL FRAMEWORK

Polit et al., (2001) stated that the framework is the conceptual base of the research but theory and a conceptual model is not important as framework in all research. Although, the research based on theory; the framework is named as theoretical framework whereas research based on a conceptual model is named as conceptual framework. The terms conceptual model, conceptual framework, and theoretical framework are used reciprocally. [27]

The theory chosen for this study is The Newman Systems Model by Betty Newman. The model was originally developed and used in 1970 at the University of California, Los Angeles. It provides a multi-dimensional and comprehensive framework of delivering adaptable holistic and system based perspective health care for nursing. [35]

Health

Betty Newman stated that health is a continuum process from wellness to illness in life that is dynamic in character and constantly changing. "Optimal wellness or stability indicates that the total system needs are being met. A reduced state of wellness is the result of unmet systemic needs." [26]

Watson defined health as "unity and harmony within the body, mind, and soul", which is originally borrowed from WHO definition, it defined health as "the positive state of physical, mental, and, social well-being with the inclusion of three elements: (i) a high level of overall physical, mental, and social functioning; (ii) a general adaptive-maintenance level of daily functioning; (iii) the absence of illness. (or the presence of efforts that lead to its absence)" [26]

Prevention as intervention

Newman stated that the intervention is essential to support the client, retain, sustain, or manage system stability which might takes place earlier or later. Interventions are based on factual amount of 'reaction,' 'resources,' 'goals,' and 'anticipated outcomes'. New-

man mentioned three levels of intervention that is primary prevention, secondary prevention and tertiary prevention. [26]

Firstly, primary prevention as intervention is based on the early detection of the stressor while the risk factor is known but response has not developed yet. The main goal of this intervention is to decrease the level of responsive factors and to reduce the chances of confrontation with the stressor. [26]

Secondly, secondary prevention as intervention or treatment was initiated when the stress have developed. The clients both internal and external willpower is used to "strengthen internal lines of resistance, reduce the reaction, and increase resistance factors". [26]

Lastly, tertiary prevention follows the intervention or treatment and secondary intervention stage. The main objective of tertiary prevention is to maintain optimal wellness by preserving relapse of occurrence. Tertiary prevention targets the client stabilization, which is reversible action toward primary prevention. "As example would be avoidance of stressors known to be hazardous to the client". [26]

4. METHODOLOGY

Qualitative approach has been applied by inductive content analysis to review the literature. A literature review has been used for this study, which assists the authors to get a clear knowledge about the area of the study. As the authors used literature review, the information about the study was collected from the pre-existing scientific research data. And also it helped the authors to explore about the different theories and existing scientific research articles.

During this study, published studies related to prevention of acute rheumatic fever and rheumatic heart disease was targeted. According to the fact that the study is based on prevention of ARF/RHD on the highly risk population with GAS infection.

4.1. Literature Review

A literature review is a compression study and interpretation of the articles that addresses a specific topic. In literature review, one tries to find the answer to the specific question. [29]

The literature review helps the author to identify different theories and previous research on the topic. Literature review is an ongoing process, which helps the author to identify the relevant theories and relevant research studies.

Literature review is important in research as the literature review helps to summarize the literature of one topic. There are many researches available, so it will be easy for reader to get assimilated information on one certain topic in one place. [29]

4.2. Content Analysis

In accordance to Polit et al., (2001), "Content analysis is the process of organizing and integrating narrative, qualitative information according to emerging themes and concepts; classically, a procedure for analyzing written or verbal communications in a systematic fashion, typically with the goal of quantitatively measuring variables." [27]

Qualitative content analysis in divided in manifest and latent content. A condensed meaning unit, coding and creating categories is used to formulate a theme, which can be considered as an appearance of the whole context of the content. [24]
Content analysis is a method of analyzing data from documents to get the result that gives the answer to the questions. The inductive content analysis is used on the basis of earlier researches. [25] The inductive content analysis is suggested for those studies "where there is not enough knowledge about the phenomenon or if this knowledge is fragmented". [25] However inductive content analysis method started with open coding, creating categories and abstraction. [25]

In this study, authors used qualitative content analysis allying the methods of Graneheim & Lundman, (2004) and Elo & Kyngäs, (2008). The selected articles and guide-

lines were read several times to understand and to get a proper theme. The data were reviewed by deriving the measuring units from the content of the documents by using different color pens to distinguish the substance. Afterward condensed units, subcategories, and finally category were formulated, which is explained in detail in result portion.

4.3. Validity and Reliability

Validity and reliability are the criteria for assessing the measurement of qualitative and quantitative data.

Polit et al., (2001) describes, " Validity is the degree to which an instrument measures with it is supposed to be measuring". [27] In other word, "validity is defined as the degree to which researcher has measured what he has set out to measure." [36] Although the term measurement procedure refers that validity is the ability of an instrument to measure what it is designed to measure. [36]

Therefore in this study, validity refers to level to which the research method has been able to meet the aim of the study. The aim of this study is to investigate the factors contributing to prevention of acute rheumatic fever and rheumatic heart disease in developing countries. While answering the questions and by using scientifically based articles and guidelines the authors believe that the study was valid and will find its aim.

According to Polit et al., (2001), "Reliability refers to the consistency with which an instrument measures the attribute." [27] In this study, reliability refers to uniformity of the finding that the fact produces similar result as in earlier research. By the use of reliable database suggested from Arcada, which proofs the collected articles and guidelines are reliable hence, the result of the study is reliable.

4.4. Problems encountered in the study

In the beginning, the challenge for authors is the search process with the use of appropriate keywords related to the topic via the database search engine. Since the database showed pile of articles, though authors read the abstract of the documents thoroughly

that consumed maximum time. Further, authors tried the best to come up with suitable materials, which were concerned to the topic and also provide the answer to the research questions.

Moreover, while collecting material most of the articles needed passwords to access therefore authors have worked only with the available articles, which are of free access. In addition, nationwide guidelines are so limited thus the author got difficulties to find proper guidelines.

4.5. Ethical consideration

"Ethics, in other word moral philosophy, the discipline concerned with what is morally good and bad, right and wrong. The term is also applied to any system or theory of moral values or principles." [37] In other word, "Ethics is a that branch of philosophy dealing with values relating to human conduct, with respect to the rightness and wrongness of certain actions and to the goodness and badness of the motives and ends of such actions." [38]

Authors have written and presented the short thesis plan to the supervisor before starting research to avoid violation. The writing of this paper is carried out a commissioned thesis as a part of project PADeT, which is under the supervision of Solveig Sundell.

The authors studied thoroughly the good scientific practice prepared by Arcada ethical committee. In the study the author's used evidence based scientific articles following the Arcada's ethical rules and thesis guideline. [39]

In this paper, scientifically approved articles were used carefully to conduct the research and to record and report results. The work, content and findings of other researchers were cautiously referenced and cited to avoid plagiarisms. In addition, the information of the chosen literatures was not misrepresented. Furthermore, authors have made every effort to stick within the ethics of Arcada.

5. RESULTS

Considering and binding within nursing perspective the authors present and summarize the facts results, which are mainly focused on preventive measures rather than curative. Though data were analyzed inward primordial prevention and primary rather than secondary and tertiary prevention of ARF/RHD.

In addition, authors attempt to get an appropriate answer to the research questions based on the reviewed literature for the study.

5.1. The Search Process

The authors chose literatures carefully within criteria to achieve the study aim and illustrate the way in which data are. The articles were chosen for inductive content analysis answering the research question used in the study. The inclusion and exclusion procedure was performed to review the preventive measures of ARF/RHD and different national guidelines as well. The topics of the articles were not enough but the content and the articles that did not fill the study criteria were omitted and were also not considered.

Table 2. Shows the criteria used during inclusion and exclusion

Including Criteria	**Excluding Criteria**
-Articles related to the study -Articles with free assess -Articles written only in English language -Articles written by scholar -Articles available with full PDF format -Articles with free text -Articles with abstract	-All articles that were not published in English language -Articles that were older than our limitation (1999) -Non-scientific articles -Non-relevant articles for the study. -Articles that charges

-Scientifically approved articles -Studies that approaches the nursing intervention. -Articles with scholarly (peer viewed) journals	

5.2. Material

All the chosen materials are in English language, scholarly (peer viewed) journals with full text retrieved from authentic databases suggested for use by Arcada. They are scientific works from professional researchers institutional without additional payment.

The literatures were obtained and gathered via Nelli-Portal an electronic database through MetaSearch using the drop down category - Health Care, Occupational Therapy, Physiotherapy, Sport Media Culture - which contained 40 databases.

The following common databases: Academic Search Elite (EBSCO), CINAHL (EBSCO), PubMed, Google Scholar, Science Direct, dictionaries and also references from articles and books were used to find the total number of papers using the keywords.

Table 3. Shows the database search process of Articles

Database	Keywords	Year range	Result	Used Articles
Pubmed	Epidemiology, rheumatic fever, rheumatic heart disease	1999-2013	120	4
CINAHL (EBSCO)	Incidence, rheumatic fever, worldwide	2001-2013	35	2
	Preventive measures, rheumatic fever, rheumatic heart disease	2001-2013	538	2

Academic Search Elite (EBSCO)	Preventive measure, rheumatic fever, rheumatic heart disease	2001-2013	3,054	3
Science Direct	Preventive measure, rheumatic fever, rheumatic heart disease	2001-2013	103	2
				13

Table 4. Shows the database search process of guideline.

Database	Keywords	Year range	Result	Used Guidelines
Pubmed	Guideline, rheumatic fever, rheumatic heart disease	2000-2013	22	2
Google Scholar	Guideline for prevention of rheumatic fever	2000-2013	17,200	3
	WHO, rheumatic fever	2000-2013	15,300	1
Academic Search Elite (EBSCO)	Rheumatic fever, rheumatic heart disease	1999-2013	17	1
Google [National Guideline Clearinghouse (www.guidelines.gov)]	Australia, guideline, rheumatic fever, rheumatic heart disease	-	-	1
				8

5.3. Analysis

Firstly, the selected articles and guidelines were read thoroughly several times to understand and to get a proper theme.

Secondly, the data were reviewed by deriving measuring units from literatures then forming condensed meaning units, subcategories and finally category using different color pens.

Lastly, the authors formulated a theme, grouped into 5 categories and 15 sub-categories using the inductive content analysis.

The study is based on the earlier scientific theories, researches and guidelines. The table below shows the list of articles and guidelines including the contents and results that were used for content analysis in the study.

Table 5. Summary of used research articles for content analysis.

Author	Title	Year	Content	Result
Mincham et al.	Patient views on the management of rheumatic fever and rheumatic heart disease in the Kimberley: A qualitative study	2003	The author used qualitative data collection method by using simple interview with the participant living in the Kimberly population of Australia to find out the knowledge of management process of rheumatic fever (ARF) and rheumatic heart disease (RHD).	Article presents the participants different level of knowledge and understanding regarding ARF/RHD and its management with medication compliance and personnel services.
Kasmaei	Mothers' knowledge about acute rheumatic	2008	Researcher had used quantitative	Within 500 participants only 443 had responded with high 86% of

et al.	fever		questionnaire method with 500 clients with five aspect of rheumatic fever and answer was scored in percentage.	knowledge regarding treatment whereas only 4% had knowledge about symptoms.
Okello et al.	Socioeconomic and environment risk factors among rheumatic heart patients in Uganda	2012	Qualitative case control method was used in this research with total 486 participants divided into two equal parts to rule out the risk factors.	Data found out by interviewing the participant's shows that the risk factor in this research was poor living condition and remote setting.
Kumar et al.	Epidemiology of group A streptococcal pharyngitis & impetigo: A cross-sectional & follow up study in a rural community of northern India	2009	In this research total 4249 participants aged 5-15yrs was used with cross-sectional method for survey with p value data was analyzed. Group A streptococcal pyogenes ruled out by standard throat culture swab for pharyngitis and skin test for impetigo.	Survey result shows that the pharyngitis without GAS was common respectively in winter than summer.
Nordet et al.	Prevention and control of rheumatic fever and rheumatic heart disease: the Cuban experience (1986-1996-2002)	2007	Imparting the knowledge regarding ARF/RHD by involving the health personnel and community people did 15yrs long ob-	The results shows that the markedly decrease in incidence and aware of disease through the educational programme.

			servational study.	
Allen et al.	Rheumatic fever in Samoa: Education as Prevention	2011	Pre-post survey with routine process focusing typical rheumatic fever concept guided by EM, SCM model questionnaire method was used, which was analyzed by SAS sampling technique.	The finding shows that the education plays a vital role to building up a belief towards each other (between client and caregiver).
Arvidsson et al.	Experiences of health-promoting self-care in people living with rheumatic diseases	2010	Unstructured open-ended set of questions were used to interview 12 participants, which was analyzed by descriptive analytic tool.	The respondents are positive toward experience of health- promotion, they took self-care as dialogue with body and environment and power struggle against fighting with disease.
Guiliherme et al.	Rheumatic fever and rheumatic heart disease: genetics and pathogenesis	2007	The relation between genesis and pathogenesis factor leading to ARF/RHD was thoroughly studied looking by simulation between streptococcal pathogens and human proteins.	The results showed that considering all the relation between genetic and pathogens B and T cell plays the vital role to develop ARF.
Utku et al.	Acute Rheumatic fever in the Central Anatolia region of Turkey: a 30 year experience in	2011	Total 1,384 ARF admitted patient's medical record was analyzed using standard tool to examine 1980-2009	During 1980-2009 the frequency of ARF/RHD was detected high in the second decade but decreased in last decade.

	a single center.		the incidence and progress of disease.	
Mota et al.	Limitations and perspectives with the approach to rheumatic fever and rheumatic heart disease	2005	Various ideas of diagnosis and limitations were examined through previous research articles and try to rule out drawback for understanding pathogenetic mechanism of ARF/RHD.	Considering all factors while the continuation towards follow up was needed with large scale of scientific investigation
Carapetis et al.	Epidemiology and prevention of group A streptococcal infections: acute respiratory tract infections, skin infections, and their sequelae at the close of the twentieth century	1999	In this article epidemiology and prevention of GAS sequela in skin and respiratory tract was discussed.	After analyzing all data from different areas the researcher found that the well planned prevention programme, proper studies of disease and operational public health program should be organized to prevent and control the GAS infection.
Mayhew	Today's Health Problems and Health Education	2004	This article discussed the different perspective of health education e.g. disease prevention, obstacles to health education, the health educator's job, today's health education content.	Educating about the nature of the disease can be the solution for further health problem.
Carapetis	Rheumatic heart disease in developing countries	2007	This article represents the perspective of RHD in developing countries through analyzing	Analyzing overall data from previous research the researcher found that, the developing countries needed an urgent attention of the international public heath and research

			various data from earlier research by content analysis method.	communities for proper diagnose of ARF and RHD to prevent and control it.

Table 6. Summary of used guideline for content analysis.

Author	Title	Year	Content	Conclusion
WHO	Rheumatic fever and Rheumatic Heart Disease – A report of WHO Expert Consultation	2004	An evidence-based review for the diagnosis and management of ARF and RHD. Authors used a qualitative method of data collection by sampling the data from the National Health and Medical Research Council levels of evidence for clinical interventions and the US National Institutes of Health clinical guidelines	Well-planned basic research studies for assessment with prompt diagnosis and effective use of limited financial and human resources
Carapetis et al.	The Australian guideline for prevention, diagnosis and management of acute rheumatic fever and rheumatic heart disease	2012	A developed guideline by deriving the materials from the updated and expands documentation from WHO and worldwide organizations	It is hard to define that the primordial and primary prevention of ARF/RHD through vaccination or the eradication or treatment of GAS infection

Bisno et al.	Practice Guidelines for the Diagnosis and Management of Group A Streptococcal Pharyngitis	2002	An update form of the further published guideline with additional relevant research through out the years with an evidence review on clinical trails of GAS pharyngitis	The author recommended throat culture and RADT for accurate diagnosis and the choice of drug: penicillin (for only those who were non-allergic to it) for treatment and management of the GAS pharyngitis
Thatai et al.	Current Guidelines for the Treatment of Patients with Rheumatic fever	1999	Reviewed the earlier guidelines in management and current principles of RHD and its sequelae	The result shows that for prevention of ARF, primarily prompt and appropriate treatment of streptococcal pharyngitis is to be done as well as secondarily with long-term antibiotics reduces the recurrence and subsequent complications.
Carr et al.	Rheumatic fever diagnosis, management and secondary prevention: a New Zealand guideline	2008	Peer review evidence based as well as relevant literature with comprising experts and their consultation adapted for the New Zealand context.	The authors summarizes the sensitivity towards the diagnosis of ARF with helps for the reliable management of ARF with an detail effective and cost-effective secondary prevention strategies which reduces ARF recurrences and also reduce problem of RHD in highly risk population.
Gerber et al.	Prevention of Rheumatic Fever and Diagnosis and Treatment of Acute Streptococcal Pharyngitis: A Scientific Statement From the American Heart Association Rheumatic Fever, Endocarditis,	2009	The statement is an update of the report on 1995 by the American Heart Association (AHA) Rheumatic Fever, Endocarditis, and Kawasaki disease committee, as well as included the latest	Articles presents various hypothesis those are unclear and un-proven concepts therefore well controlled studies must be established to prevent the occurrence of acute rheumatic fever.

	and Kawasaki Disease Committee of the Council on Cardiovascular Disease in the young, the Interdisciplinary Council on Functional Genomics and Translational Biology, and the Interdisciplinary Council on Quality of Care and Outcomes Research: Endorsed by the American Academy of Pediatrics		research derived from evidence based data and classification of recommendations for the diagnosis and treatment of GAS pharyngitis and also the secondary prevention of RF.	
Saxena et al.	Consensus Guidelines on Pediatric Acute Rheumatic Fever and Rheumatic Heart Disease	2008	Discussed, reviewed and recommendations about the differences in management protocol of earlier literatures and to formulate management of RF and its complications	Article shows that initial diagnosis of GABHS pharyngitis and its treatment is the only way of primary prevention in the absence of effective streptococcal vaccine
Carapetis et al.	An Australian guideline for rheumatic fever and rheumatic heart disease: an abridged outline	2007	A guideline briefly and short description that is helpful for health care practitioner in primary care center for the control and diagnosis ARF/RHD.	The result present that proper care planned strategy should bring into practice.

5.4. Abstraction Process and Interpretation

In this chapter, the authors seek to answer the questions based on the collected data from the literatures.

After reviewing and analyzing the literatures regarding to the research questions, which discusses latest issues and guidelines about prevention of ARF/RHD, education (knowledge) shows as a main theme. Generally, authors focused on the topic from a nursing perspective.

From the gathered data from the literatures, the author's were able to develop the theme and also to provide answers to the research questions as the categories and subcategories were based on paper aim and research questions.

The figure below shows the process of theme formulation for the study.

Generating theme using Principle of Inductive Content Analysis

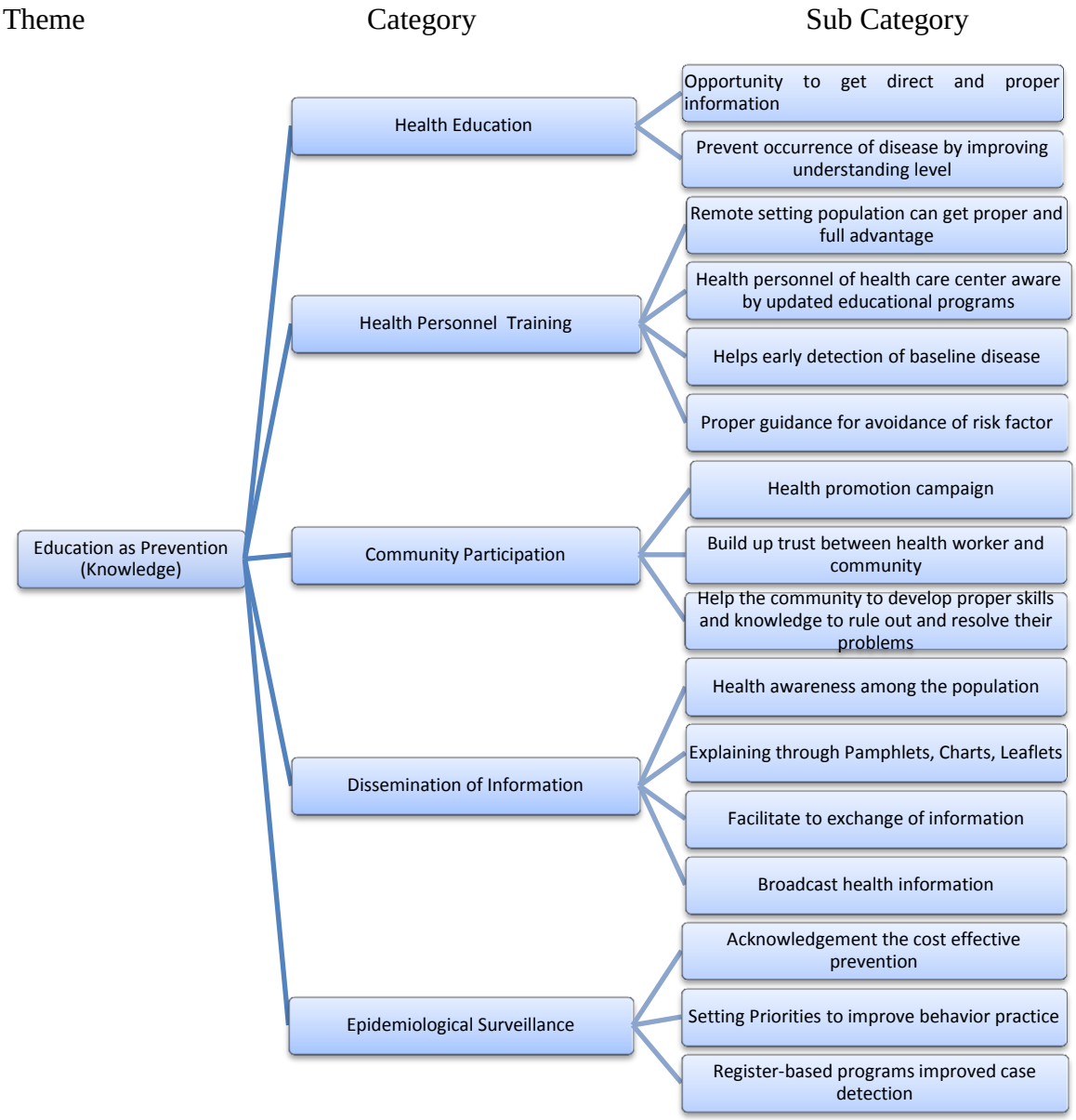

Figure 1. Illustrates the abstraction process

Interpretation

In this chapter author further describe the results of the study and will explain about the categories, which were formulated from the study.

5.4.1. Education as Prevention (Knowledge)

Acute rheumatic fever and its sequelae of rheumatic heart disease remains a major public health problem, mainly in developing countries. [3,4,6,7,9,13,14,15,17,18,19,21] In contrast, ARF/RHD is rare and an occasional threat after years of inactivity in the industrialised countries. According to researchers, the epidemiology of ARF in industrialized nations had declined dramatically in the late nineteenth century with an unknown reason. [3,4,6,9,14,15,17,19,21] However, among isolated and rural population of industrialized countries there is high prevalence ratio of ARF/RHD. [1,13,14,15,17,18,19,20]

ARF occurs as the consequence of group A β hemolytic streptococcal (GABHS) infections, that can be prevented and simply treated, [1,2,3,4,7] which is a challenge for healthcare administrators. [14,18] The disorder is mainly a disease of children among 5-15 years of age, [1,2,4,5,10,13,14,15,18,19] and in temperate climates it usually occurs in winter and early spring. [1,14,15,16,17,18,19] Among all cardiac admissions, 25% to 40 % are the consequent complication of chronic RHD. [17]

Researches state that, the factor influence the highest rate of occurrence of the disease is limited access to health care services. [1,2,3,4,6,14,15,17,18,21] In addition, over-crowding, poor living condition, insufficient resources for quality health care, inadequate health care providers and mostly low level of awareness, lack of knowledge and awareness in the inhabitants about ARF/RHD contribute. [1,2,3,6,7,10,12,13,14,15,17,18,19,20,21]

National levels of RHD control activities had developed for proper recording and reporting the occurrence of the disease and update the evidence-based guidelines, conduct health education program, training and health professional assets, increase community awareness program about ARF/RHD control and prevention. [1,3,5,6,10,14,15,18,21]

5.4.1.1 Health Education

Health education is crucial in general population, to understand and identify the cause and to manage and recognize symptoms of the illness. Also health education activity improves knowledge on methods and benefits, which reduce and avoid the spread of infections. [2,5,6,7,10,12,14,15,17,18,21]

Health education activities must refer to both primary and secondary preventive measures of ARF/RHD. [5,6,7,10,14,15,17,21] The activities were focused on certain population and community with a face-to-face interview of individuals and with their relatives to acquire specific needs and limitation. [2,5,6,12,14] The programs should be conducted by professional health personnel such as trained doctors, nurses and instructors, which must be focused on community, teachers and parents of school-age children. [1,5,6,10,14,15,17,21]

In most cases prevention of initial attacks of ARF can be achieved by proper diagnosis and treatment of streptococcal infections. [1,5,6,8,10,13,14,15,17,18,19,20,21] One of the study finds that it is important to make an exact diagnosis of ARF: as over diagnosis could result in unnecessary dose of BPG and under diagnosis leads to suffering for reoccurrence attacks of ARF, further cardiac damage and premature death of individuals. [18] People are more vulnerable to have recurrent episodes of ARF if they have had previous history of ARF and that may also cause cardiac valves damage. [1,2,4,5,9,10,13,14,15,17,18,19,21] Hence, the people with multiple occurrence of ARF have a progressive and the highest possibility of RHD. [1,2,4,5,6,8,9,10,13,14,15,17,18,19,21]

GABHS infections are the initial cause of ARF. [1-11,13,14-21] Patients with GABHS primarily appear with symptoms such as sore throat, difficulty to swallow, and fever. Also headache, nausea, vomiting, and abdominal pain might be present in children. [2,4,5,6,10,14,15,17,18,19,21] Therefore, it is important for early recognition of sore throat to minimize the risk of ARF. Sufficient therapy is needed for GAS infection to prevent ARF. [5,10,13,14,15,16,17,19,21] In temperate climate mainly in winter and spring GAS infections occurs in school-aged children 5-15 years of age. [1,5,7,13,14,15,16,21] Generally streptococcus carriers do not need additional antibiotic therapy as GABHS present inactively

in their pharynx with no sign of immunologic response to the organism. [16] Throat culture is a standard diagnosis method to confirm GAS infection. [1,2,4,5,6,7,9,10,14-21] While, routine throat culture is not necessary except in special condition for those who have completed antibiotic therapy course. [16]

5.4.1.2. Health Personnel Training

Health Personnel Training is important to carry out health educational programs and training programs for the health care providers, which provides an appropriate and update information about illness. Also training for health care personnel towards the disease improve to understand of history, proper diagnosis, planning, coordination and implementation of appropriate prevention and treatment method of the disease. [1,2,5,6,14,15,17,18,21] The provincial, local and health unit as a part of medical education province conducts such programs via workshops, and conferences or updating health education with contribution of invited lectures and specialized doctors and nurses. The trainings are mainly for staff of local hospitals, primary health care centers, and clinics. [5,6,10,14]

In the study, there are rare incidents of ARF in most urban places, where there are trained health professional and practice with only few numbers of health care practitioners. [21] There is a huge irregularity in the management of ARF/RHD where there is lack of up-to-date knowledge, training and experience, which sometime result in improper management of these illnesses. [1,5,6,11,13,14,15,18,20,21] In developing countries where there is an insufficient availability of physicians, public health nurses are important to run ARF/RHD prevention programmes by planning, organizing and implementing. [14,15]

The determinant key factors were the accessibility and adequacy of the health services and presence of active members and follow up systems. In contrast, in public health center where there is active follow up of BPG, adherence is significantly better by dedication of staff member who administers the BPG. [1,2,5,6,7,13,14,21] Therefore, well-structured medical supporting system with better quality and easy availability of medical care and treatment for all inhabitants reduces the episode of ARF. [5,6,14,15,17,18,21]

According to literature it is essential for a well-planned, initial analysis of a prospective, and longitudinal research to understand absolute epidemiology of GAS infection in developing countries for successful implementation of public health prevention program. [5,6,14] Further a well-documented case population based epidemiologic study of illness with a close observation history of GAS infection would be useful for diagnosis and getting aware of a high incidence of GAS infection in the general public. [5,6,14,19,21] In addition, proper treatment of respiratory tract infections, and establishing less crowded environments were significant aspects for better quality of health services to reduce the prevalence of the illness [10,14,15,17,18,19,21]

In accordance to provide accessibility to prevention, screening, and other services, mobile screening should be organized at school and community level where health facilities are not available or at a far distance from the general population. [3,5,6,14] Early detection of GAS infection can prevent a recurrent episode of ARF and reduce the rate of RHD that also may leads to premature cardiac death. [2,5,6,10,11,14,15,17,18,19,21] Henceforth, training among primary care doctors about the proper diagnosis and treatment of GABHS infection benefits to decrease the incidence of ARF/RHD and progress the level of economic status in developing countries. [1,4,5,6,10,14,15,16,21] Patient should get appropriate antimicrobial therapy to destroy the organism (GAS) from the body. [14,15,16,17,21] Furthermore, prompt diagnosis and treatment of patients with GAS infection is essential to decrease the risk of spread of the organism, allows fast recovery of the patient, and also reduces the morbidity rate with illness. [1,2,5,6,10,14,15,17,18,19,21]

Similarly, the primordial prevention of ARF/RHD is fundamental by reducing higher risk and direct exposure of GAS infection, which needs drastic improvement in living conditions, diminishing household overcrowding, individual behavior, better hygiene infrastructure, and socio-economic development, on top improvement of access to health system. [1,3,5,6,10,11,14,15,17,18,21] The risk of ARF is tremendously less in adult comparison to school-aged children. [2,6,14,15,16] Correspondingly, poor communication could result in poor understanding of the illness and adverse effect resulting negative treatment and management. [1,2,5,6,7,8,10,11,14]

5.4.1.3. Community Participation

Community participation is the best way to spread message by promoting health campaign, helping the community to develop proper skills and knowledge to rule out and resolve their problems and building up trust between health worker and ty. For this purpose, approaches should be focused on a coordinated control program for expanding BPG adherence and clinical follow up for person with RHD. [1,2,5,6,10,14,21]

To enhance the uses of resources and awareness of problems relating to ARF and RHD management, the workshops were conducted by public health personnel and local expert. [1,6,14] In addition, some researcher proposes that, not only the prevention campaigns need to be focused on upper respiratory tract infection but also the throat and skin infections pathogenesis, which causes ARF, should also be focused on. [4,5,10] In native people in industrialized nations regarding awareness program have got some success. [5,14] WHO has been published a cardio vascular disease (CVD) program manual with recommendations for preparing a plan of operation for ARF and RHD prevention and control. [14]

Furthermore, this is a part of the prevention program that; as schools are responsible for scattering the infection, they can also be responsible for its control. The identification of the susceptive children for ARF should be done by school health services and also trained community health workers can do the screening of ARF within the high incidence area of RHD. For improvisation of the client adherence to secondary prophylaxis and in follow-up programme, involvement of community people and teacher can play a vital role. [6,14,15]

It was considered that good relationship between health workers and community people will prevent the complication on health care activity within the multicultural area and also in results. In addition, improper language and the hasty behavior of the staff where client may hesitate to ask any questions are the examples of obstacles, which explain the relationship between patient and staff interaction. [1,2,3,5,6,14]

The “co-operation”, “effectiveness” and “dedication” of health staffs and community people like; “health administrators”, “educational administrators”, “teachers” and “community leader” are the key factors for achieving an appropriate result of a prevention programme. [14] In contrast, clients themselves and their families involvement in the control strategies by community must be better for their health. [1,2,5,6,10,14]

5.4.1.4. Dissemination of information

Door to door prevention programs can be achieved by the dissemination of information through spreading health awareness among the population, explaining information through pamphlets, posters, charts and leaflets, facilitating exchange of information and broadcasting health information.

The community and schools are the places where health education campaigns takes place and which seems the best way to communicate the health message for school children and their parents. Indirectly, via the school children’s health message could be passed to the parents. While implementing the ARF/RHD control program, transmitting and networking of health information; patient, commitment of the school, school health services to the health education of children are crucial. [6,7,14] At the end of the session distribution of the educational material is also the good way for ARF/RHD prevention. [6,10,14]

Furthermore, broadcasting through regional radio and television channels for advertisements and educational information 3-4 times yearly and supplying visual aids and printed health information by health staff was emphasized for success of prevention program. [1,6,10,14]

5.4.1.5. Epidemiological Surveillance

Epidemiological surveillance is the essential part in the prevention program of ARF/RHD, which facilitates all to acknowledge the cost effective prevention and set priorities to improve behavior practices.

For an epidemiological ratio of the disease, proper information is beneficial for evaluation of registration by surveillance of ARF/RHD. [1,5,6,14] According to the study, permanent surveillance of ARF/RHD was held for a long duration of 10 years, which included proper registration of morbidity and mortality; healthcare and educational programs, and agreement for a conducted program plan. [6] In the study prevention of ARF/RHD is developed, easy process, inexpensive, and cost-effective even though it was implemented insufficiently and sometimes not implemented among the elevated risk of the population of illness. [14,15,21]

The literature shows that adherence of national guidelines reduces the rate of ARF/RHD which support and avoid the economic burden of secondary and tertiary prevention. [6,8,18] Primary prevention activities of ARF/RHD are proven as a cost effective measure. [1,3,6,14,15,17] Secondary prevention activities must be started only after the confirmed and proper diagnosis of ARF/RHD. [2,2,6,10,14,17,18,20] Among choice of drug, Benzathine Penicillin G (a deep intramuscular antibiotic injection) is proven as an effective, efficient, narrow spectrum, safety, and low cost and also amoxicillin is used in replace as penicillin-V (oral antibiotic) in children for treatment of GABHS infection. [5,6,7,10,13,14-21]

The surveillance report of ARF/RHD would be a beneficial source on the epidemiological trends of the disease, if it is included into the national statistical data. And also regular analysis and evaluation of the disease in defined areas would provide useful sources about the characteristics of disease. Authorization reported that the seasonal frequency, circulation of streptococcal pharyngitis, incidence of ARF/RHD, and the level of Antistreptolysin O titers in the school children might be determined by epidemiological survey. [5,6,11,14]

"A recent summary of the data on the disease burden of ARF and RHD in Australia concluded that these diseases are almost exclusively restricted to Aboriginal and Torres Strait Islander people living in regional and remote areas of central and northern Australia." [15,21] Furthermore, the global burden of GAS related disease reviewer reported that there are ARF /RHD cases without carditis still require preventive treatment. The incidence and hospitalization ratio of RHD was higher in aboriginal population than non-aboriginal, living in the same area. [14,15,18,19,21] Also a report by Wairoa College shows that, there was not decline in the manifestation of ARF/RHD in isolated region of developed country like New Zealand. [18]

In the future to reduce the permanent occurrence and avoid sequelae of the ARF/RHD establishment of "the large scale data collection system" and "obligatory notification system" would be beneficial. [10] Furthermore, for primary prevention program availability of descriptive and "reliable" data need for definite recommendation. [5]

The timely evaluation of the key elements and indicators are suggested and a formation of a "coordinated control program" in those area where there is highly incidence of ARF/RHD. [1,2,6,11,14,21] Maintaining the record of the history of ARF, which is the key element of RHD control at "individual", "community" and "national level". [21] Furthermore, register based programs improve case detection, decrease ratio of ARF and hospitalization for ARF and RHD, monitor ARF patient movements, familiarize staff for ARF "ongoing care requirements", rule out the poor adherence toward long term therapy and also observe the success of prevention program and variation in disease epidemiology. [21]

In addition, for the people with a history of ARF/RHD a structure based care plan should be established and documented in the health center record. [1,5,6]

6. CRITICAL REVIEW OF RESULTS

The study is obtained by reviewing the evidenced based scientific literature. The authors might get better answer to the questions also other articles that require password and extra fee to access would have been added.

The formulated questions have been organized to get appropriate answers, which could have been better results if have had found more effective articles and national practice guidelines had been found.

Initially, the study discusses about the cost-effective prevention, which is still an ongoing research on the development of a vaccine. Furthermore, literatures illustrate that primary prevention is now a cost-effective method while secondary prevention is the economic burden for developing countries. [1,3,6,10,1314]

The earlier studies mentioned that there is no any non-pharmacological prevention if the heart gets involved. [11]

The chosen guidelines were mostly focused on pharmacologically assisted treatment of the disease. However, author's intended to assess the portion regarding preventive strategies from the practice guidelines.

7. DISCUSSION AND CONCLUSION

This objective of this study was to investigate the preventive measures for rheumatic fever and rheumatic heart disease by reviewing literatures with the set of questions, and by analyzing the articles and general guidelines.

The findings are analyzed in concordance to 'The Newman Systems Model' by Betty Newman, for improving awareness among the general population about the illness with

the importance, focused basically on primary prophylaxis of disease with using concepts of primary prevention and secondary prevention [26] including health education, health personnel training, community participation, dissemination of information, and epidemiological surveillance in the basis of the theoretical framework. [1,2,4,5,6,7,8,10,12,14,15,17,18,19,21]

Evidence presented in this study reveals that occurrence of ARF is most prevalent in poor and overcrowding countries of the world. [1,2,4,5,6,7,10,13] The socioeconomic, behavioral and environmental factors played an indirect but crucial role that risks the inhabitants for developing ARF and consequently RHD. [1,3,5,6,10,13,14,15,17,18,21] Moreover, the low understanding level, compliance with management, [1,3,5,6,7] poor staffing and services, overpopulation, remote setting of health center, [3] low educational status, shortage of facilities, low level of awareness and community involvement and poor relation between health staff and community people were also exposed. [1,2,5,6,7,10,11,14,15,18]

According to the reviewed articles and general guidelines, primordial prevention of rheumatic heart disease is directly or indirectly related to the prevention of risk factors of GABHS by progressing and improving socioeconomic and behavioral condition and infrastructure of living condition to reduce the burden of economic for secondary prophylaxis mostly in the developing countries. [1,3,5,6,7,11,13,14,18,21] When these primary prevention methods are ineffective then treatment and management of GABHS has to be conducted using BPG, an intramuscular injection or oral Penicillin V (or amoxicillin). As for patient hypersensitive to penicillin, Erythromycin or Azithromycin can be used. As penicillin is of low cost and effective drug with narrow spectrum, it is the choice of drug used for secondary prevention of ARF/RHD broadly recommended worldwide. [1,2,5,6,10,14-21]

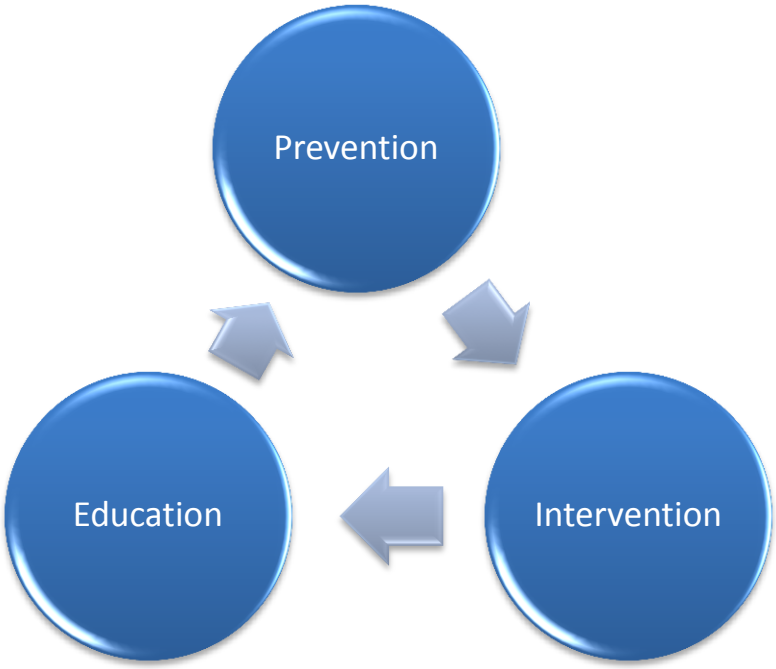

Figure 2. Shows the co-relation between Prevention, Intervention and Education.

The result found that if proper and update health education could conveyed to health care personnel and public, then the proper result can be obtained regarding to appropriate knowledge towards prevention of disease. [1,2,6,14,17] Hence, considering all issues authors found that 'knowledge' is the main idea that needs to be revealed and conveyed to the general population and health care provider, who promote health of individuals. [1,2,3,5,6,7,11,1314] Therefore, there is a correlation between education, prevention and intervention in this study. Further, authors have made 'education as prevention' as to be emphasized as a main theme after the whole study process.

Regarding to the background information 'preventive measures' connects Newman's theoretical framework 'prevention as intervention' and findings of research result 'education as prevention', all of them are interrelated and proof of that the results found by the authors is valid and reliable. During the study process, it was an interesting discovery for the authors about the similar disease in different localities. The authors interest and determinations in this study played a vital role to get appropriate result.

In conclusion, the authors achieved the results through the practice based effective trail literatures and guidelines, that there has been the co-relationship between prevention, intervention and education. The study shows that by educating prompt diagnosis and treatment of baseline disease is crucial for prevention of acute rheumatic fever and rheumatic heart disease. Earlier evidence explains primordial prevention is cost effective which avoid the burden of managing rheumatic heart disease that might affect the economy of the developing countries.

8. RECOMMENDATION

Establishing interpersonal relationship between healthcare team and the community people and conducting disease awareness health campaigns and other activities such as; dissemination of simple pamphlets, posters, educational materials plays an important role to convey health education information as well as to provide a quality care efficiently.

National control program and strategies must be carried out for treating GAS infections: sore throat, pharyngitis and acute episode of ARF.

Organizing “effective prevention” and education programmes regarding GABHS infections, for expanding socioeconomic status of the population and for enhancing living status of big families and nutritional intake and for delivering easily accessible health facilities are the purposes for which lowering the incidence of ARF and also permanent sequelae rates must be a part of basic health policy.

Proper implementation of national guideline should be done to decrease the reoccurrence of ARF and to reduce the burden of RHD within high-risk population.

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APPENDICES

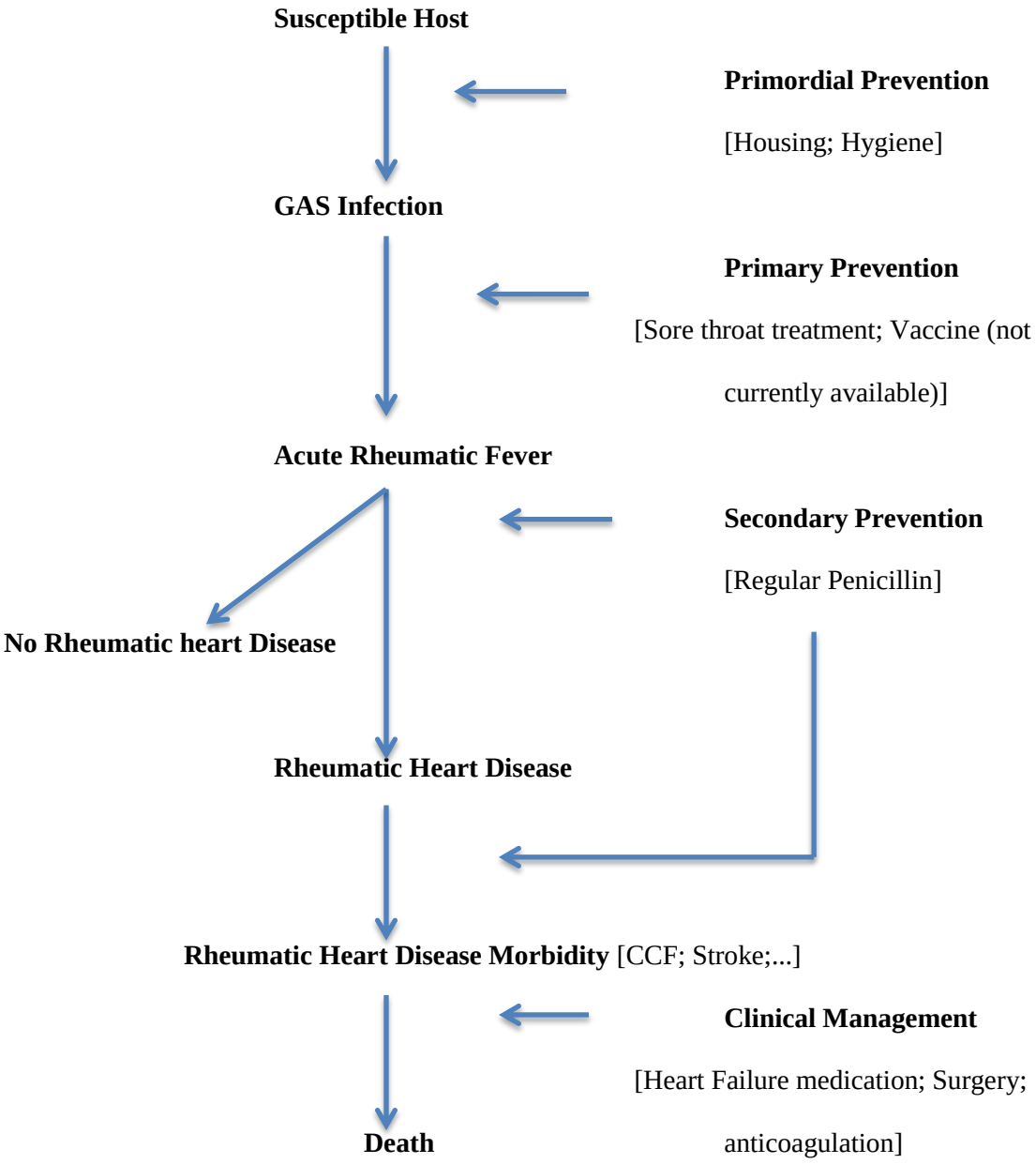

Figure 3. Shows the preventive strategies of Rheumatic Heart Disease. (Carapetis et al, 2009)