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Primary Pyomyositis: Its Socioeconomic Effects; A Community Overview. A Qualitative Study Design

David Lagoro Kitara[1*], Paul Okot Bwangamoi[2], Henry Wabinga[3] and Michael Odida[3]

[1]Department of Surgery, Faculty of Medicine, Gulu University, Uganda.
[2]Department of Pharmacy, Faculty of Medicine, Gulu University, Uganda.
[3]Department of Pathology, College of Health Sciences, Makerere University, Uganda.

Authors' contributions

This work was carried out in collaboration between all authors. Author DLK did the study design and wrote the protocol. Authors HW and MO did the statistical analysis and literature searches while analyses of study was by author POB. All authors read and approved the final manuscript.

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ABSTRACT

Aims: To assess the community's views on the socioeconomic effects of primary pyomyositis to patients, family, health facilities and community.
Study Design: A cross-sectional study design using qualitative research methods
Place and Duration of Study: Gulu Regional and other Hospitals in Northern Uganda from September 2011 to November 2013.
Methodology: The study was conducted among patients with primary pyomyositis, next of kin, health workers and opinion leaders on their views on the socioeconomic effects of pyomyositis. Key Informant Interviews, Focus Group Discussions and In-depth Interviews were used to obtain qualitative information. Ethical approval for the study was obtained from Gulu University IRB and the National Council of Science and Technology (UNCS&T). Thematic content analysis was used for analysis of this qualitative data.

**Corresponding author: Email: klagoro@gmail.com;*

Results: Primary pyomyositis has several socioeconomic effects to patients, family, health facilities and communities. The effects of the disease ranges from simple disability to inability to earn a living thus deepening the economic status/crisis of individuals, families and communities. It creates series of social problems that make local leaders become less useful to their communities and also sets-in marriage related problems. Education of the school going children are usually affected leading to school dropout.

Conclusion: There is a wide range of socioeconomic effects of primary pyomyositis to the population of Northern Uganda and it is presented with a number of socioeconomic effects similar to those chronic diseases such as HIV/AIDS.

Keywords: Primary pyomyositis; socioeconomic effects; Gulu; Northern Uganda.

1. INTRODUCTION

Pyomyositis is a suppurative inflammation of large truncal and proximal lower limb muscles and it is mainly caused by *Staphylococcus aureus* [1]. This infection is increasingly common in non-tropical regions but highly prevalent in tropical regions [2]. Many cases of pyomyositis have been reported in patients with immunosuppression including HIV/AIDS since 1987 [3]. Reports from Northern Uganda indicate that pyomyositis is a very common disease especially in the second and third decades of life and it is a major cause of severe disability, morbidity and contributes significantly to delay hospital stay [4]. The aetiology of pyomyositis remains unknown despite the frequency of staphylococcal bacteriaemia and sepsis. Pyomyositis remains an intriguing disease of unclear pathogenesis [5] and it is postulated that organisms reach skeletal muscles during transient bacteriaemia [5]. Some studies have indicated that when normal muscle is damaged, it is susceptible to haematogenous invasion by bacteria with subsequent and resultant abscess formation [6]. It is postulated that the abundant iron which is available after trauma of muscles, results in profuse growth of bacteria [7]. The other postulated mechanisms which were not proven included nutritional deficiencies [8], viral and parasitic infections [5-11]. It has been suggested that an abnormality of the immune system may be the underlying risk factor of pyomyositis in many cases [5] where lymphocytes, particularly T-cells in pyomyositis patients are not primed adequately against *Staphylococcus aureus* during the course of infection [12] and that could be the predisposing factor to the disease. The frequency of culturing *Staphylococcus aureus* has been a common finding in most studies on pyomyositis; however there are other organisms that are frequently observed including haemolytic *Streptococci, Pasteurella, Yersinia enterocolitica, Hamophilus influenzae, Klebsiella* [13], group A β-haemolytic *Streptococci*, *alpha-haemolytic Streptococci and non-haemolytic streptococci, Peptostreptococcus, Streptococcus pneumonia, Staphylococcus epidermidis, Staphylococcus pyogenes, Streptococcus pyogenes, Streptococcus anginosus, coliform, Fusobacteria, Haemophilus influenza, Escherichia coli, Neisseria gononrhoeae, Citrobacter freundii and Pseudominas* species [14-17]. These infections are believed to be a complication of transient bacteraemia because it develops without an obvious penetrating injury or any other clear portal of entry in the vast majority of patients [18-22]. The other predisposing factors for development of pyomyositis has however been described to include: Trauma to muscle, injection drug use, concurrent infection, and malnutrition [1,23-26]. Immunodeficiency especially from HIV/AIDS has been implicated in the development of pyomyositis in both temperate and tropical regions [1,5]. Other forms of immunodeficiency associated with pyomyositis include Diabetes mellitus, malignancy, Liver diseases, renal insufficiency, organ transplantation and administration of immunosuppressive agents [1,5,27].

Therefore, this disease is a threat to social and economic development in developing countries and can lead to poverty, affecting particularly young people in their most productive age [28]. It weakens family and societal support systems, decreases participation in formal education of young people, along with depleted family income due to loss of work and poor disease management thus presenting more additional vulnerabilities to families, patients and communities [28]. Pyomyositis is a threat to social and economic development and it leads to poverty, affecting particularly men, women and young people in their most productive ages [28]. Several researchers have proposed that effective prevention and care in enabling environments

can only help those with chronic diseases e.g. pyomyositis to overcome their devastating outcomes [28]. It is suggested that by an appropriate response to support those affected by chronic disease and other related conditions, everyone gains and no one losses [29]; Families' gain as the income from work continues, children gain as they continue to receive support from their families and in this way people living with these diseases remain productive longer and the state and communities gain because production is not disrupted in key sectors such as education, agriculture, farming and public services [29].

Socioeconomic status (SES) and effects are often measured as a combination of education, income and occupation and it is commonly conceptualized as the social standing or class of an individual or group [29,30]. Socioeconomic status is typically broken into three categories; high, middle, and low SES to describe the three areas a family or an individual may fall into [29,30]. So when placing a family or individual into one of these categories any or all of the three variables (income, education, and occupation) can be assessed [29,30]. Additionally, low income and little education have shown to be strong predictors of a range of physical and mental health problems, ranging from illnesses of the respiratory system, arthritis, coronary disease and schizophrenia [29,30]. These may be due to environmental conditions in their workplace, or in case of mental illnesses, may be the entire cause of that person's social predicament [29,30]. Pyomyositis often have a negative impact on socioeconomic status of a person by constraining an individual's ability to work and earn income [30]. A previous research has indicated that up to 45% of people living with HIV for example are unemployed [31] and the effects of this chronic disease on the physical and mental functioning can make maintaining regular employment difficult [31]. Patients with chronic diseases such as pyomyositis infection may also find that their work responsibilities compete with their health care needs [31]. Furthermore, individuals affected with chronic diseases are often discriminated against in their workplaces, leading to their termination of services or forced resignation [32,33]. Children infected with HIV/AIDS and pyomyositis for example may often exhibit cognitive deficits when compared with their uninfected peers and these deficits have been found to adversely affect learning and earning ability later in life [34]. Against this background, the present study was undertaken to assess the socioeconomic effects of primary pyomyositis to patients, family, communities and health facilities.

2. PATIENTS AND METHODS

2.1 Study Setting

This study was conducted in Gulu, Kitgum, Pader and Agago districts in Northern Uganda from September 2011 to November 2013. The centres where this research was conducted were in: Gulu Regional Hospital, Lacor Hospital, Kitgum Government Hospital, Kitgum St. Joseph's Hospital and Kalongo Hospital which are situated in the above districts. This region where the study was conducted is just recovering from over 20 years of civil war between the Government of Uganda and Lord's Resistance Army (LRA). The population of these districts are largely rural; many of whom were displaced into camps infamously known as internally displaced peoples camps (IDPS) for over 10 years for safety from insurgency. It is estimated that over two million persons in this region were displaced into IDP camps from 1996 to 2008 where they were being fed nearly exclusively on food provided by the United Nations World Food Programs (UNWFP). Reports from World Food Program indicated that they provided only 60% of the required calories of food per person per day. The community had no other options of obtaining food since their farmland were inaccessible due to the insecurity and ordinances planted on their land during the war. According to the Gulu, Kitgum, Pader and Agago district development plans 2009/2010, the 4 districts have a total population of about 1,200,000 people [35].

2.2 Study Design

We conducted a cross-sectional study design using qualitative research methods: Six Focus Group Discussions with patients and next of kin and four In-depth Interviews with selected primary pyomyositis patients and eight Key Informant Interviews with health workers:

2.3 Selection of Study Participants

We consecutively recruited pyomyositis patients undergoing treatment and rehabilitation at these Hospitals in Northern Uganda for Focus Group Discussion however; patients for the in-depth interviews were selected purposively. Key informant interviews were conducted with health workers who were involved in the medical and

surgical management of these patients. These were independently diagnosed by the Principal Investigator and his research team using an approved proforma designed for their recruitment and management. Those patients that did not consent to the study were excluded.

2.4 Data Collection Methods

2.4.1 Key informant interviews (KIIs)

Eight key informant interviews were conducted with the Health workers of these Hospitals. The staffs interviewed included the Medical Superintendents/Hospital Directors, surgeons, matrons, in-charge of surgical ward, theatre nurse, next of kin, supplies officer and medical officers of these health facilities who were mainly involved in the medical and surgical management of these patients. Key informant interviews were guided by a KII guide and were administered by the Principal Investigator assisted by his research assistants. Each key informant interview session lasted between 60 to 90 minutes and was only completed when the issues to be discussed were exhausted.

2.4.2 Focus group discussions (FGDs)

Six focus group discussions were conducted with the patients and attendants; two groups were with the male patients; additional 2 groups with the female patients and the last 2 groups with their next of kin. Each discussion group comprised of 8-10 participants who were selected to be relatively homogenous in terms of age and level of education to facilitate free participation among members. The FGDs was guided by a focus group discussion guide, and this was moderated by the Principal Investigator. During the discussions, the proceedings were recorded in a note book and summarized in themes which were designed for the recruitment and management of these patients. Because the majority of the patients and next of kin were mainly from Acholi tribe which speaks Luo; both Luo and English languages were used during the discussion to aid free discussions among participants. Each FGD session lasted between 60 to 90 minutes on average. Cordial working environment was observed until most of the important issues were exhaustively discussed.

2.4.3 In-depth interviews (IDIs)

Four in-depth interviews were conducted with 4 patients who were purposively selected because of their special and in-depth information they had about the disease and the massive influence they had on their peers and community. These patients included: a primary school teacher, a Chairman Local Council one (LC1), an elderly woman and a young girl. The In-depth interviews were guided using the IDI guide which were developed during the recruitment and management of pyomyositis patients and were administered by the Principal Investigator assisted by his research assistants. Each session of the interview lasted between 60 to 90 minutes and was completed when all the issues raised were discussed exhaustively.

2.5 Data Analysis

The Principal Investigator and his research assistants collected data which were triangulated and transcribed into electronic text and summarized into key themes that were selected before and during data collection and analysis process (thematic content analysis).

2.6 Ethical Approval

The study was approved by the Institutional Review Committee (IRC) of Gulu University Medical School GU/IRC/02/01/11 and Uganda National Council of Science and Technology (UNCS&T) HS 922. Informed consent and assent was obtained from each individual patient or next of kin in the presence of their parents/guardians. Confidentiality of information from individual person was protected for all the participants of this research.

3. RESULTS AND DISCUSSION

3.1 Socioeconomic Effects of Diseases

The economic burden of diseases on a person or population can be assessed by adding the direct costs of expenditure on prevention and treatment with the indirect costs of productive labour time lost because of morbidity and mortality [36]. These costs can be assessed at the micro-level to provide insight into the effects on individual households and businesses and at the macro-level, to show the effects on the economic performance of a nation [36]. For instance, the financial and economic costs of treatment and control of neglected tropical diseases are often considered from the perspective of the health-care provider, most notably the costs faced by government-funded health facilities [36].

Individuals and families normally have heavy out-of-pocket (direct) costs when seeking care for treatment for these diseases [36].

In Ghana for example, the cost of care per patient with Buruli ulcer in a household in the poorest earning quartile was reported as 242% (193-315%) of their annual earnings, which can be regarded as catastrophic [37]. By contrast, in a household in the richest earning quartile the cost per patient was reported as 94% (89-105%) of their annual earnings [37]. This shows that although the economic effect on both income groups is catastrophic, this difference indicates inequity, since treatment costs disproportionally affect the incomes of the lowest-income households [37,38].

A study in Sri Lanka reported how the poorest patients with lymphatic filariasis were driven into the medical poverty trap, and how they delayed accessing the health-care system, thereby allowing the symptoms to progress and making treatment difficult or impossible [39]. Studies in Thailand and South Vietnam found that an average family pays US$74 and $67 respectively, to treat a child with dengue haemorrhagic fever, which was more than an average monthly salary at the time when the studies were done [40,41]. The indirect costs to people affected by neglected tropical diseases and their carers and the economic effect on a household for example, further compounds costs to the patients and families [42]. It is therefore important to note that measuring morbidity and mortality are key considerations for estimating the burden of diseases in populations [43] however, focusing only on morbidity and mortality effects provides an incomplete picture of the adverse impact of ill health on human welfare and in particular, the economic consequences of poor health which can be substantial [44]. Health 'shocks'−such as unexpected increases in health expenditure; reduced functional capacity and lost income or productivity are often a primary risk factor for impoverishment [44,45]. Poor levels of health may also adversely impact educational attainment and consequent levels of future income [45]. All these negative economic effects have been observed in patients affected by primary pyomyositis in Northern Uganda. The affected persons are mainly from rural areas. The main cost to them is the indirect cost which is usually not quantified.

At societal level, poor population health is associated with lower savings rates, lower rates of return on capital and lower levels of domestic and foreign investment; all these factors can and do contribute to reduction in economic growth [46]. So, measurement of these various adverse impacts provides decision-makers with an indication of the extent to which a specific disease or, more generally, depleted health status disrupts or reduces economic production or consumption opportunities at the household or societal level [46]. It has been observed that in many developing countries the average consumption of non-health related goods and services is close to the subsistence level, so households are often forced to decrease domestic savings, to sell assets or to increase commercial or informal borrowings [42,43]. This has been observed with primary pyomyositis patients who complained about loss of income and savings leading to several negative socioeconomic effects to themselves, family, and community. Therefore, the aggregation of these separate transfers frequently implies that increased health expenditures exert an overall negative impact on savings at the societal level [46,47]. Several studies have assessed this negative impact on savings and have shown that it is likely to be considerable, especially in case of epidemics such as HIV/AIDS [47-50]. On the other hand, lower aggregate savings are likely to lead to increase in interest rates and the opportunity cost of investment, which can then impact negatively on the formation of capital and ultimately on economic growth [50].

Furthermore, several studies have suggested that improved health conditions exert a direct impact on economic growth by increasing worker productivity [51-54]. A healthier workforce enjoys greater physical and mental ability and therefore is able to produce more with the same amount of inputs [53,54] and in this case, the aggregated impact on economic growth of increased labour productivity can be quite substantial [53,54]. For instance, an analysis of the economic impact of historical improvements in nutrition in England and Wales, Fogel [55] showed that around one third of the growth of the British economy over the period 1780-1980 can be attributed to better nutrition and greater efficiency in transforming nutritional input into economic value. Furthermore, some authors have argued that this effect is especially important in the context of developing countries, since a high proportion of labour force in these countries is engaged in manual work and productivity tended to be more

reliant on the sheer physical capacity to work [56-58]. As has already been observed, the majority of these primary pyomyositis patients studied were school going children or peasant farmers who earn their living through manual activities. In case of sickness, all their economic activities come to a halt affecting their families, relatives and community.

In this case therefore, health improvements that increases the number of healthy workers for a fixed stock of land and capital in the economy might lead to higher unemployment or lower wages [57,58]. Therefore, Pyomyositis often have several negative socioeconomic effects by constraining the ability of an individual to work and earn income. In this study, there were varying views among patients, health workers and relatives about the socioeconomic effects of pyomyositis on patients, families, communities and health facilities.

3.2 Social Effects of Pyomyositis on Patient and Family

A nurse at the surgical ward of Gulu Hospital said,

> *"Pyomyositis is a very devastating disease to patients because it deprives the family off their bread winners; isolates them; depresses them. They lose their social status in their community and confine them to their hospital beds. Some family members have complained that pyomyositis prevents spouses from fulfilling their conjugal rights and in some instances it has led to family misunderstanding, extramarital affairs and sometimes divorce".*

Similarly, in one of the focus group discussions, a patient with pyomyositis at Gulu Regional Hospital said,

> *"I have lost so much due to this disease because it deprived me off my routine earnings, it isolated me from my family, it made me to become depressed; I lost my social status in this community and it confined me onto this hospital bed and denied me the opportunity to have my conjugal activities and in some instances, it has led my wife to have an extramarital affairs and my wife has even threatened to divorce me".*

On the issue of family matters and its linkages, another patient with pyomyositis at St. Joseph's Hospital in one of In-depth interviews said,

> *"Socially, I can no longer perform my duties as Chairman LC 1 because I have been sickly for a very long time and I am confined to this Hospital bed for some time. I cannot sit on a chair for a long time and I am always in pain and sometimes my body has bad smell and this makes me feel out of place when in public gatherings. I can no longer attend community functions and most members of my community claim that I can no longer lead them because I am always absent. This has reduced my influence in the community activities and made me to become less approachable although I still struggle to conduct my work normally".*

It has been observed that an important socioeconomic consequence of disease or injury at the household level is that, through its impact on functioning, individuals are unable to perform their usual day-to-day activities [56]. Just as being fit and healthy tend to boost productivity (particularly in lower-income countries) where employment opportunities tend to depend more on physical strength and endurance; so poor levels of health restrict productivity [56].

3.3 Economic Effects of Pyomyositis on the Patient and Family

Another patient with pyomyositis at Kitgum Government Hospital said,

> *"I have lost so much income due to this disease; my business of retail trading has collapsed; I am no longer receiving the profits from my business; my suppliers have stopped supplying me because the previous bills have not been paid and the shop attendant has run away with money from the previous sales; I am therefore currently spending more than the profit I used to earn; and my children have been chased away from schools because of lack of school fees".*

This observation is not new in that, increased health expenditures are also foreseen to impact on government's resources by reducing the amount of household taxable income and increasing the amount of expenditures that have to be covered out of public funds [59]. The resulting impact on public budgets is that it limits the government's ability to spend resources in

other areas, particularly in social expenditures such as education, health and in public investments in infrastructure projects, sanitation, science and technology, and other strategic areas [59]. Public investment is a major source of economic dynamism and economic growth in many developing nations [59]. Consequently, reductions in public investment resulting from increased health expenditures can seriously compromise long-run economic growth potential [59]. On the other hand, tighter overall budgets can compel governments to increase the level of taxation in order to meet increased additional health expenditures [59]. This in turn can have macroeconomic repercussions by depressing the aggregate demand and therefore limiting the growth potential of the economy [59].

3.4 Cost of the Disease to the Patient and Health Facility

On the overall cost of treatment of pyomyositis to a hospital, a theatre nurse at Gulu Regional Hospital who has been in service for over ten years said,

> *"The cost of treatment of pyomyositis is very high compared to other surgical diseases because several surgical equipments have to be sterilized, several sundries and dressing materials have to be used, expensive antibiotics has to be used, anaesthetic agents, resuscitation equipments and the long duration of illness and hospital stay. It would be good to prevent the development of pyomyositis in this community"* and she added further, *"we are actually not sure exactly the total cost of hospital management of one pyomyositis patient since most costs incurred are not recorded but met by the Hospitals e.g. the cost of electricity and water consumed/utilized".*

Similarly, in most Focus Group Discussions held, there were no agreement on the total cost of treatment of the disease to the patient and family. They cited the lack of recorded details of costs incurred which could be used to verify the total amount of money actually used".

On the economic effects of the disease on the family and patient, an attendant of one pyomyositis patient at Kalongo Hospital said,

> *"This disease depletes resources from our hands through expenses we incur on transport to and from the Hospital on a daily basis. We have to pay for food, water and good diet for the patient. This has caused a lot of financial stress to the family and relatives. We keep on borrowing from neighbours, friends and in-laws and we hope when the patient recovers, he will have to work very hard to pay back the debts we have accumulated over the period. We have sold nearly all our food reserves from the granary and we have moved through several steps in order to achieve healing or some remedies for the illness. We, as a family are now becoming food insecure and no more money for school fees for the children for the next term. We shall therefore need to take a bank loan although the interest rates currently are very high. In summary, the disease is making our family poor".*

Since the effects of changes in the demographic composition caused by diseases are intrinsically dynamic, it is however possible that negative impacts in the present can be transformed into positive shocks in the future and vice-versa. Bloom and Canning [60,61] and [62] described the concept of "demographic dividend" as countries undergo a process of demographic transition from high to low rates of mortality and fertility.

Improvements in health and sanitation conditions for example can cause significant declines in rates of child mortality and consequent demographic explosion with exponential rates of population growth [62]. Over time, as parents adapt to the new environment with low child mortality, the fertility rates also tend to decline, with the effect that we will observe a baby boom cohort that is much larger than both the preceding and the following birth cohorts [63]. Bloom and Williamson [63] examined the significance of this effect in explaining the rates of economic growth in East Asia during the period 1965-1990. The results suggest that population dynamics account for 1.4-1.9% of annual GDP per capita growth in the region during this period (approximately half of the overall growth observed) [63]. Conversely, Bloom and Malaney [64] estimated that reduced population size caused by the mortality crisis seen in Russia during the 1990s contributed significantly to reduced economic growth over this period. It is therefore important to examine the overall effects of a disease to the person, family, community and the whole country.

3.5 Costs Related to Treatment of Patients

On the cost incurred by the Hospital in managing patients with pyomyositis, a nurse at Gulu Regional Hospital said,

> *"I estimate conservatively that we use about five hundred to one million Uganda shillings (approximately $400) to manage one pyomyositis patient and this excludes the personal cost to the individual patient". She further added, "the cost varies widely depending on the stages of the disease, co-morbidities, nature and complications that may have already occurred on the patient. Those with larger abscesses and in advanced stages of the disease are more likely to spend longer time in the hospital and therefore larger amounts of money would be used".*

On the economic effect of the disease in running health facilities, an in-charge in the surgical ward in Kitgum Government Hospital who was a key informant said,

> *"Pyomyositis patients have increased the bed occupancy rates of our hospital because they spend longer than other surgical patients; they use plenty of water; medical sundries and electricity that have to be paid for by the Hospital. Their management grossly affects the utilization of resources in this health facility; I suggest that it would have been better if the disease was prevented if the cause could be known especially those occurring in this region".*

It has been similarly observed that some diseases affect mainly the working age population and can exert significant pressure on the demographic structures [65]. High mortality rates among working age populations can lead to increasing dependency ratios, and lower population and labour force growth, with quite substantial economic impact in terms of loss of market output [65]. There are also possible implications for reduced investments in human capital formation, since the young might be forced to engage earlier in market productive activities and also in non-market production, for instance acting as informal carers [65].

3.6 Effects of the Illness on the Job

On the responses of the employers, one patient who had a prolonged absence from work at Kitgum Government Hospital said,

> *"I have already received a warning letter from my employer because of my prolonged absence from duties. My supervisor thinks I am just lazy to return to work and probably I have chosen stubbornly to remain in this hospital. This unfortunate but unfair report has tainted my records in Public service just because they do not understand this disease. I am unfairly treated; they do not understand the disability I have acquired because of the disease. I suffer lots of pain and the joints and the muscles are weaker and this has created the biggest disability in my life. The employers need to understand this problem and provide both social and financial support to the employees suffering from pyomyositis because it affects me negatively socially, emotionally, physically and economically".*

Weil [53] identified a number of indirect channels through which health can affect economic development and increase labour productivity. First, improvements in overall health conditions can contribute to lower absenteeism and worker turnover, and to increase cognitive functioning [53]. In the same way, these factors might have important implications for production costs [53]. Absenteeism and increased worker turnover often force firms to hire additional workers, who then need to receive additional training and require time to adapt to their new functions [53]. On the other hand, improvements in cognitive abilities can contribute to improve the quality of education for a given level of schooling, which in turn can be expected to improve labour productivity [53].

In addition, productivity losses and lower working capacity resulting from disease and injury often lead to reduced household earnings. This can have important aggregate implications, even though some countries have counterbalancing mechanisms in place, such as systems of disability insurance, that can help to mitigate the effects for the household. From a macroeconomic perspective, however, the resulting lower economic efficiency implies that the overall level of production for a given amount of inputs is reduced [53].

Lower productivity and income generation can exert knock-on effects on aggregate demand and supply, which can hinder the pace of economic growth. For example, reduced spending power at the household level might discourage firms from investing in productive capacity and contracting

workers, further intensifying the reduction in aggregate demand [53]. The second indirect channel of impact of better health on economic growth identified by Weil [53] is via increased incentives to delay retirement and to save for retirement. Some diseases that affect mostly working age population groups and can contribute to reduce labour market participation and force people into early retirement, reducing the average retirement age. This in turn can have important impacts on the dependency ratio in the economy and by extension on potential economic growth [53].

Moreover, the additional numbers of individuals that are forced into early retirement often require special medical care and specialized services. This can contribute to reduce the amount of resources that can be directed into productive activities and can also exert cost pressures on businesses, via increased health care costs and insurance premiums [53]. On the other hand, the expectation of longer retirement periods resulting from mortality improvements often leads to higher savings during active life, which in turn can contribute to increase the stock of physical capital per worker [53]. As discussed above, the third channel through which health improvements affect economic growth is via improved incentives to investing in education due to longer payoff periods in the labour market [53].

Changes in the demographic composition of a nation can have significant impacts on economic performance and for instance, changes resulting from mortality variations that increase the dependency ratio can impact on economic growth [53]. Reductions in the size of the working age population due to sexually transmitted pandemic diseases such as HIV/AIDS are a case in point [53].

3.7 Pyomyositis and Socioeconomic Status

As observed in this study, most primary pyomyositis patients were pupils and peasant farmers and most cultured *S. aureus.* Peasant farmers and pupils are generally in the lowest socioeconomic status and may have been predisposed to risk factors for the development of pyomyositis. It should also be noted that most of these patients were from rural areas and had limited exposure to common antibiotics and thus perhaps the reason why the disease developed through its different stages to pus formation. If they had enough resources and adequate access to health care, they would have been diagnosed early and treated or perhaps they would have used some antibiotics to arrest the disease early in its pathology. None of the patients suffered from Methicillin Resistant *S. aureus* (MRSA) which is a common nosocomial infection. This bacteria was susceptible to common antibiotics including Ciprofloxacin, Tetracycline, Gentamycin and Erythromycin; a rare finding which is only observed in areas where there is limited antibiotic abuse or an underserved/limited access environment.

3.8 The Way Forward with Regards to Pyomyositis

On the way forward, an attendant of one of the patients in Kitgum Government Hospital suggested that because pyomyositis was so rampant in the communities where they live, it was advisable that intense mobilization and sensitization of the community should be undertaken to dispel the misconceptions about it and also design an activity that should remedy the socioeconomic effects of the disease. She suggested that the mobilization and sensitization should include the elders, opinion leaders, church leaders and local government officials so as to reach all persons in the community that still suffer quietly with the disease.

4. CONCLUSION

There is a wide range of socioeconomic effects of primary pyomyositis to the population of Northern Uganda and it presented with a number of socioeconomic effects similar to those experienced in chronic diseases such as HIV/AIDS.

CONSENT

All authors declare that written informed consent was obtained from the patients, next of kin, families, health workers and communities for publication of this manuscript.

ETHICAL APPROVAL

All authors hereby declare that the protocols have been examined and approved by the appropriate Ethics Committee and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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