

Chapter 5

Disparity in Rhinitis and Rhinosinusitis



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Nancy

Nancy is a 47-year-old white, single mother who is admitted to the medical intensive care unit (MICU) for significant respiratory distress and sepsis. Nancy lives in a small town in Pennsylvania with her four children where the closest hospital is almost 1 hour away. She has suffered from nasal polyps, asthma, and recurrent infections since she was 20 years old. For as long as she can remember, she has been unable to breathe well. It is almost impossible for her to breathe through her nose and she has no sense of smell. She suffers from recurrent sinus infections and recurrent “bronchitis.” In the past year, her asthma was severely uncontrolled despite several courses of prednisone which she received from repeated ER visits. She saw an ear, nose, and throat (ENT) specialist 2 years ago who told her that she needed to undergo surgery for her nasal polyps and gave her two nasal sprays; however, it seemed nearly impossible to undergo the procedure, particularly because she would need almost five visits to the ENT office around that time and it is 65 minutes away from her work. She was also evaluated by an allergist/immunologist who ordered laboratory tests, as she suspected that there was something wrong with Nancy’s immune system. However, she could not complete the blood work, as she had to head back home to her children. Her situation became more complicated when she lost her insurance coverage 1 month later. Nancy along with six other employees at the small supermarket where she worked was laid off when the supermarket went

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out of business. Since then, she has worked two part-time jobs but does not have insurance and can hardly afford her medications. Yesterday, after a long day at work, while feeling feverish and suffering from headaches and shortness of breath, she drove herself to the ER. She was found to have severe pansinusitis, pneumonia, and low oxygen saturation. She was transferred to a tertiary care hospital in Pittsburgh and was admitted to the MICU.

Introduction

Rhinosinusitis is symptomatic inflammation of the paranasal sinuses and nasal cavity [1]. This condition is extremely common affecting one in eight adults in the United States with direct costs exceeding 11 billion dollars annually [1]. Socioeconomic, racial, and health insurance disparities are prevalent in the United States, and socioeconomic disparities are linked with higher mortality and worse health status [2]. Given the high prevalence and economic impact of rhinosinusitis, health disparities are likely to have a large effect on vulnerable populations. While disparities in patients with rhinosinusitis are underresearched and poorly understood, differences have been noted. Rhinosinusitis can be classified into acute versus chronic with etiologies including viruses, bacteria, environmental and seasonal allergens, and fungal triggers. The impact of health disparities on each will now be discussed.

Acute Rhinosinusitis

Acute rhinosinusitis (ARS) is defined as symptomatic inflammation of the nasal cavity and paranasal sinuses that lasts for less than 4 weeks [1]. ARS is extremely common in both adults and children with an estimated 20 million cases annually in the United States [3] and nearly a million pediatric visits in ambulatory and hospital settings [4]. ARS can be due to viral or bacterial etiologies, and differentiation has been the focus of recently renewed efforts to avoid overtreatment with antibiotics.

Complications including orbital or intracranial infection are rare, and most ARS visits are uncomplicated and can be managed in an outpatient setting with supportive care or oral antibiotics. Despite this, there are over 500,000 ED visits for ARS annually [5]. The prevalence of ED visits for ARS is associated with health insurance type and patient race independent of socioeconomic status. Both children and adults with Medicaid and self-pay utilize the ED more often than patients with private insurance [5, 6]. Multiple studies have shown an association between poor access to primary care and presentation to the ED for non-urgent conditions. Patients with lower socioeconomic status and those who are uninsured, underinsured, or have Medicaid tend to lack access to outpatient care, resulting in unnecessary ED utilization [7–9]. Medicaid and uninsured populations use overall less care for acute

rhinosinusitis, but present disproportionately to the ED overnight and on weekends for uncomplicated ARS, indicating that barriers to healthcare access are likely to blame for ED overuse among these populations [10]. Using the ER for conditions that can be managed in the outpatient setting has an economic impact on overall healthcare spending and costs to individuals in terms of direct ER costs and indirect costs of lost time and productivity.

The reasons for differing ER utilization by insurance type for ARS is not clear; however, there is evidence to suggest that it is not related to disease severity. Medicaid patients have similar ARS symptomatology and levels of pain compared to privately insured patients; thus, symptomatology alone does not account for their disproportionate ED use. Furthermore, no difference was found in quality of care by insurance status to explain this increased ED utilization. Medicaid and self-insured patients received the same quality of care, and Medicaid patients spent more time with their doctor during visits for ARS than those with private insurance. Therefore, barriers to outpatient care are likely related to impaired access to primary care and after-hours outpatient care [11].

There are also differences in ER utilization for ARS by race. African American patients more likely present to the ED, even after adjustment for other socioeconomic variables [5]. There are racial differences in symptomatology. African American and Hispanic patients are more likely to have atypical symptoms with a lack of classic sinonasal symptoms than white patients. This may make it more difficult for these patients to accurately identify the source of their symptoms and result in their seeking ED care more commonly [12]. Symptomatology alone is unlikely to explain these racial differences, which are likely a combination of environmental differences, affordability, and access to care, genetic differences in disease progression, and cultural factors.

Complications of ARS are rare but can include preseptal or orbital cellulitis, orbital or subperiosteal abscesses, and intracranial complications like cavernous sinus thrombosis, intracranial abscesses, and meningitis. Children from higher socioeconomic status experience more frequent complications from acute bacterial sinusitis, but Medicaid and self-pay patients, markers of low socioeconomic status (SES), have higher intracranial complications, which are more severe [13]. Since patients with Medicaid and self-pay status are likely to have decreased access to primary care and timely preventative care [14, 15], they may be presenting with more severe manifestation of this disease. Children from low-income families with Medicaid or no health insurance are less likely to receive preventative care and therefore are more likely to present at advanced disease stages for a variety of conditions [16, 17]. Diagnostic imaging varies by SES with individuals from smaller metropolitan areas and lower median income significantly less likely to get a CT scan in the ED for sinusitis [18, 19].

There is some conflicting evidence regarding health disparities and ARS, and at least one study did not find a statistically significant association between acute sinusitis resource utilization and charges and insurance status or race [20] and another study which did not find differences in rates of surgical intervention in children based on SES or race [21].

Chronic Rhinosinusitis (CRS)

Chronic rhinosinusitis (CRS) is a common chronic disease affecting 2–16% of the population [22], and pediatric CRS affects 2.1% of children [23]. Symptoms include nasal obstruction, mucopurulent drainage, facial pain and pressure, and hyposmia lasting at least 12 weeks with evidence of nasal inflammation on examination or imaging [1]. CRS is most prevalent in adults between the age of 40 and 64 years and is more common in women (59%) than in men and in patients with asthma, chronic obstructive pulmonary disease, and allergic sensitization. Patients with CRS have significantly diminished quality of life with negative impacts on sleep quality, cognition, mood, and psychologic functioning [24]. Symptoms can be debilitating resulting in loss of productivity [25] and missed days of work and school with high individual and societal costs, particularly as CRS tends to affect patients within their most productive work years [24, 26]. There are geographic differences in CRS, which is more common in the Midwestern and Southern United States compared to the Northeastern and West [22]. The etiology of CRS is a combination of atopy, immune dysregulation, microbiome, and impaired mucociliary clearance with the end result of uncontrolled inflammation. As CRS is a common chronic medical condition that entails significant direct costs of medical visits, diagnostic expenses, medical therapy, and surgical costs in addition to indirect costs of lost productivity and work absenteeism, disparities may significantly impact racial minorities and socioeconomically disadvantaged populations.

Currently Existing Disparities in Rhinosinusitis

There are racial and ethnic differences in insurance status, specialist visits, and treatments for patients with CRS [27]. African American adults have the highest frequency of sinusitis (13.8%) and highest rates of work absenteeism (23%). More Hispanics and African Americans with CRS are uninsured and are more likely to delay medical care because of cost-related concerns compared with white and Asian adults [27]. White patients are more likely to have been seen by a specialist or received surgical treatment [27].

Social determinants of health are associated with utilization of tertiary care rhinology services. In children with CRS, white and privately insured patients are most likely to be seen by a tertiary care center otolaryngologist. Income, education level, insurance status, and white race were found to be associated with tertiary rhinology utilization, though the only independent predictor was education level [28]. White patients are more likely than African Americans to be seen by a specialist or receive surgery despite having similar rates of sinusitis [27]. These differences may be due to differences in access, perception of disease severity, or differences in the course and presentation of the disease [29].

In terms of differences in disease severity, lower SES is associated with higher subjective CRS symptomatology [30]. Hispanic patients report statistically significant worse baseline scores on the Rhinosinusitis Disability Instrument after controlling for socioeconomic factors; however, they did not report comparatively worse scores on the Chronic Sinus Survey (CSS) instrument, CT, or endoscopy [27]. Improvements in olfactory function and quality of life after surgical intervention also vary by SES with patients with the highest household income more than twice as likely to experience a clinically meaningful QOL improvement [31].

Similar to ARS, there are conflicting studies that do not show differences. One study did not find disparities in severity and previous medical management with regard to race/ethnicity, education status, or income level as determined by zip code; however, this was a disproportionately white population that self-referred to a tertiary care center in Massachusetts, a state which has higher than average insurance levels [32].

A recent systematic review concluded that there is a distinct association between CRS and low SES. This study also concluded that poor housing conditions with older housing, more environmental pollutants, and dampness are also associated with CRS prevalence and severity. The association between education level and CRS was less clear [33].

Overall, while data are limited, current evidence indicates that there are both racial and socioeconomic differences in the prevalence and treatment of CRS, and racial disparities are still seen even when controlling for socioeconomic variables.

Allergic Sensitization

Allergic sensitization is an important contributing factor to both chronic and acute rhinosinusitis. In CRS especially, there is a high prevalence of allergic sensitization to aeroallergens (50–85%) [34–38]. There are racial and socioeconomic differences in aeroallergen sensitization. A small number of studies have reported differing aeroallergen sensitization patterns with African American children and adults experiencing more sensitization to both food and aeroallergens than white patients; however, there is little consistency in which aeroallergens are most prevalent, and little is known about sensitization rates in other racial and ethnic minorities. One study done in Atlanta found that aeroallergen sensitization profiles differed between African American and white children after controlling for socioeconomic variables and geographic residential features by zip code. In white children, dust mite sensitization, pet sensitization, and a higher prevalence of indoor pet ownership predicted ED use, whereas in African American children, mold sensitization predicted ED use [39]. Another study of middle-class children in Suburban Detroit also found that African American children were more likely to be sensitized than white children to ragweed and bluegrass. This study compared children of similar socioeconomic status living in the same suburban city [40]. Another study found that in children with asthma, Puerto Rican ethnicity is associated with an increased risk of

sensitization to indoor and outdoor allergens including cockroach, dust mite, mixed grass pollen, and mugwort/sage. They also found that African Americans have higher sensitization to outdoor allergens that included mixed tree and grass pollen, mugwort/sage, and ragweed [41].

African American women are more than twice as likely to be sensitized to at least three aeroallergens than white women. African American and Hispanic women were also found to be more likely to have asthma; however, they were less likely to have seasonal allergic rhinitis and eczema than white women [42]. Another study supported these findings that African American women were more likely than white woman to be sensitized to aeroallergens and have higher total IgE levels and a diagnosis of asthma, but are less likely to have seasonal allergic rhinitis and eczema than white women. These associations persisted after controlling for socioeconomic and environmental variables [43].

The etiology of these differences and the roles of genetics, socioeconomic, and other factors that contribute to these observed differences is not well understood, but current evidence and scientific reasoning do not indicate that genetics plays an overwhelming role in observed racial disparities [44]. Environmental exposure is a likely causal candidate; however, in many studies, differences persist even after adjusting for key environmental factors like allergen and endotoxin levels in home dust [44].

Allergic Fungal Rhinosinusitis (AFRS)

Several studies have found that allergic fungal rhinosinusitis (AFRS) is more common and more aggressive in African American males [45] with a higher incidence of AFRS in African American, uninsured, and Medicaid patients even after adjusting for socioeconomic factors such as insurance, education, and income [46]. Furthermore, African American adults have more severe symptoms from allergic fungal sinusitis, tend to present later in disease course, and have greater improvement after surgery than white patients [47]. However, other studies have not found an association with bone erosion and low SES [48]. A more recent study in a larger cohort found that disease severity was associated with lower SES by county level, but not by race, indicating that there are likely contributions of poor-quality housing and access to healthcare [49].

Conclusion and Final Remarks

There are many limitations to the current evidence on rhinosinusitis and health disparities. Only a small number of studies have been longitudinal, and there is a lack of standardized definitions, databases, and methods used to identify trends [33]. National administration databases, for example, the Nationwide Emergency

Department Sample database, Kids' Inpatient Database, and the National Hospital Ambulatory Medical Care Survey, do not report actual income level, but rather infer medical income level of the child's zip code. Much of the research to date utilizes ICD-9 coding, which can introduce biases due to incorrect coding. Most databases do not include data from all 50 states, and many are limited to a single city or geographic area, limiting generalizability [50]. There are significant differences in study methods, definitions, and measures used for SES and databases from which information was drawn, making it difficult to fully generalize findings [33].

Despite these limitations, the data still show important trends. Several studies have shown that there is a clear link between low SES and the prevalence and incidence of rhinosinusitis [33]. It is well known that economically advantaged patients have greater access to medical care and greater health literacy and that minorities and those with lower SES tend to delay medical care due to cost-related concerns, job security, and transportation concerns. Rhinosinusitis is an incredibly common condition with significant potential morbidity; therefore, health disparities are likely to have a large effect. The reasons behind these racial and SES differences are not completely clear. Controlling for socioeconomic factors like income, education, and insurance status will often account for some, but not all of, health differences by race [51]. Given the lack of true biological differences by race to account for this difference, there is likely residual confounding from undefined variables [27].

In case of our patient, Nancy, her disease poor outcome and significant morbidity could have been prevented by proper treatment and follow-up which were impacted by SES-related obstacles and low resources. Increasing our understanding of the existence of health disparities in the prevalence, treatment, and complications of rhinosinusitis can shape treatment decisions and affect patient outcomes.

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