Prevention of Community-Acquired Pneumonia in Situations: Diabetes

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Abstract

Diabetes has become a major public health issue in India, with increasing morbidity and mortality related to its complications. Infectious diseases are more common in diabetic patients of all age groups due to immunocompromised state, and community-acquired pneumonia (CAP) is one of the major causes of hospital admissions in these patients. Pneumonia especially invasive carries high mortality rate in diabetes, even in non-diabetic patients presenting with hyperglycemia at the time of admission. Infectious disease prevention is often ignored in comparison to other macro and micro vascular complications of diabetes. Vaccination against Streptococcus pneumoniae and influenza can effectively prevent the occurrence of pneumonia due to these organisms and can effectively reduce the burden of hospitalization and morbidity and mortality related to it. Worldwide, well-established guidelines already exist regarding vaccination in diabetes, but considering availability and affordability in our country, mass administration of adult vaccination in diabetes still remains a big lacuna, as we are still lacking behind in providing recommended care to all diabetic patients.

Community-Acquired Pneumonia and Diabetes: The Link

Diabetes mellitus is an independent risk factor for developing lower respiratory tract infections. Pulmonary infections due to Streptococcus pneumoniae, Legionella, and influenza are associated with increased morbidity and mortality. They also increase expenditure to Health System, already overburdened due to diabetes and associated conditions. Multi-level alterations in pulmonary host defenses may be the cause of people with diabetes being more prone to lower respiratory tract infections. Patients with diabetes mellitus have impaired immunity, which predisposes them to a range of infectious diseases, including pneumonia. Diabetes is seen in every fourth or fifth patient with CAP. Moreover, diabetes is closely associated with cardiovascular disease and stroke, which are major contributors to complications of CAP. The link between diabetes and CAP is further strengthened by diabetes-associated conditions, such as a greater risk of aspiration, impaired lung function, decreased immunity, pulmonary microangiopathy, and associated obesity. There may also be a direct effect of chronic hyperglycemia on certain host defense functions, such as phagocytosis, chemotaxis, and bactericidal activity of histiocytic cells.

Lepper et al¹ found that patients without pre-existing diabetes who have hyperglycemia on admission to hospital with CAP are at significantly greater risk of death than patients with normal glucose levels on admission. These were the findings of a study that examined 6,891 patients hospitalized with CAP. In all the patients, hyperglycemia was found to be associated with increased mortality at 28 and 90 days. Additionally, those with hyperglycemia on admission were considerably more likely to die at 90 days than patients with normal glucose levels on admission. The risk of mortality was directly proportional to the glucose levels at admission. The team found that patients with DM (diabetes mellitus) had the highest mortality rate after 90 days, regardless of their glucose levels on admission, while those without diabetes and normal glucose levels had the lowest rate (Figure 1). The investigators concluded that serum glucose levels on admission to hospital are very significant predictors of mortality in CAP patients with no pre-existing diabetes. Therefore, patients with acute hyperglycemia may require intensified care to reduce their risk of death.

Fig. 1: Effect of admission glucose levels on mortality

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Prevention

Vaccination and optimal hygiene can be strategies to prevent apart from optimal glycemic control in diabetes. Early diagnosis, as well as prompt antimicrobial therapy (according to local sensitivity) can impact morbidity and mortality in lower respiratory tract infections and CAP in diabetics.5

Pneumococcal vaccine

In diabetics, pneumococcal vaccine strategy may be justified because it is a high-risk group. Both global and Indian infectious diseases societies as well as diabetic societies recommended pneumococcal vaccine in diabetics, especially in the elderly, those with chronic kidney disease, chronic lung diseases like chronic obstructive pulmonary disease (COPD) and bronchial asthma, smokers, and patients who have immunocompromised state due to any concomitant conditions.

According to the Advisory Committee on Immunization Practices (ACIP) guidelines, in adults ≥ 65 years, pneumococcal conjugate vaccine (PCV13) should be administered at least 1 year after pneumococcal polysaccharide vaccine (PPSV23), followed by another dose of PPSV23 at least 1 year after PCV13 and at least 5 years after the last dose of PPSV23.3 In India, however, the recommended age for administering pneumococcal vaccine is 50 and above, as per the Geriatric Society of India recommendations, which need evidence base.4 The American Diabetes Association (ADA) in its recommendations in 2015 has endorsed the recent CDC advisory panel recommendations that both PCV13 and PPSV23 should be administered routinely in series to all adults aged 65 years or older.5

Pneumococcal Vaccine–Naïve People

Adults aged 65 years or older who have not previously received pneumococcal vaccine or whose previous vaccination history is unknown should receive a dose of PCV13 first, followed by PPSV23; a dose of PPSV23 should be given 6–12 months following a dose of PCV13. If PPSV23 cannot be given within this time period, a dose of PPSV23 should be given during the next visit. The two vaccines should not be co-administered, and the minimum interval between vaccine dosing should be 8 weeks.5

Previous Vaccination with PPSV23

Adults aged 65 years or older who previously have received one or more doses of PPSV23 should also receive PCV13 if they have not yet received it. In addition, PCV13 should be given no sooner than 12 months after receipt of the most recent PPSV23 dose. For those for whom an additional dose of PPSV23 is indicated, this subsequent PPSV23 dose should be given 6–12 months after PCV13 and at least 5 years since the most recent dose of PPSV23.5

Influenza vaccine

The ADA quotes the ACIP guidelines that recommend influenza vaccine for diabetic patients aged ≥ 6 months.4,5 Vaccination should start from September, before the influenza season each year, to reduce the impact of influenza epidemic each year.4

Irrespective of age, both of these vaccines are recommended in all diabetic patients with:2,4

- Chronic kidney disease
- Chronic lung diseases like COPD, bronchial asthma
- Immunocompromised state due to any concomitant conditions
- Diabetes patients who smoke
- Poor hygienic conditions (especially slum dwellers) and those who frequently travel to high-risk areas

Efficacy and Safety of Vaccination

World literature and many meta-analyses clearly suggest that pneumococcal vaccine effectively protects against invasive pneumococcal disease (IPD). Based on this, pneumococcal vaccination is still considered appropriate for patients in high-risk groups, as mentioned above, especially diabetics, chronic kidney disease, and elderly. Both of these vaccines are considered to be safe, and the side-effects are usually mild,7 which can be easily managed by primary care physicians. They should be avoided in patients with hypersensitivity to the active substances or to any of the excipients of the vaccine. Influenza vaccines are contraindicated in patients with recent history of Guillain–Barre syndrome within 6 weeks of a previous influenza vaccination and history of chicken egg allergy.7,8

Conclusion

Diabetes carries a high risk of getting various infectious pneumonias, which are having high morbidity and mortality. Vaccination against Streptococcus pneumoniae and influenza may be an effective way to prevent these pneumonias. This may reduce the burden of hospitalization in these patients and also reduce morbidity and mortality related to it. However, adult vaccination strategies are still under used in India and evidence base is being generated. Effective implementation of universal vaccination in all diabetic patients is still a challenge in developing countries like India, and needs strong efforts from physicians and public health experts.

References