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The Impact of Socioeconomic Status on the Prevalence and Management of Diabetes

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ABSTRACT

Diabetes cases are rising globally, with estimates projecting the numbers to reach 643 million by 2030. The rising cases are a result of different factors such as aging, inadequate physical activity, poor eating behaviors, and the rising overweight and obesity numbers. Social determinants of health, particularly socioeconomic status (SES), have been shown to be a contributing factor to diabetes prevalence. The different components of SES, namely, income, education, and occupation, contribute to the rising obesity prevalence, affecting disease onset and progression. These factors also affect how people manage the disease and the subsequent outcomes. Effective diabetes management is important because it reduces complications and improves overall health outcomes. However, factors such as low income, lower educational attainment, and uncertain employment status make it difficult to afford the necessary diabetes care. These factors also affect healthcare utilization, which explains why people with low SES tend to have poor diabetes outcomes. It is important to understand how these factors work to improve diabetes management and outcomes. Therefore, this review explores how SES impacts diabetes prevalence and management.

Keywords: Diabetes, Prevalence, Socioeconomic status, Income, Education, Occupation, Diabetes management

Introduction

Over the last four decades, there has been a significant rise in the number of diabetes cases, with the International Diabetes Federation (IDF) estimating the number of adults living with diabetes to be 537 million.¹ Although these numbers account for all types of diabetes, approximately 90% of these cases are type 2 diabetes.² Different factors contribute to the rising global type 2 diabetes prevalence. They include aging, a decrease in physical activity, a rapid increase in urbanization, and the rising overweight and obesity cases. The IDF projects that the number of diabetes cases will reach about 643 million in 2030 and 783 million by 2045.¹

Understanding factors that contribute to the rising diabetes prevalence is important. Other than being a debilitating condition that contributes to high mortality and morbidity rates, diabetes has serious health complications. Some of these complications are diabetic retinopathy, diabetic neuropathy, diabetic nephropathy, and diabetic foot. In 2021, diabetes accounted for 6.7 million deaths and approximately 966 billion dollars in health expenditures.¹

Research has shown a link between social determinants of health (SDOH) and the rising diabetes

prevalence. Race, ethnicity, income, housing, and neighborhood environment contribute to diabetes, its complications, and mortality.³ The recent IDF statistics support these findings, with three in four adults who have diabetes residing in low- and middle-income countries.¹ Socioeconomic status (SES) is one of the key components of SDOH that has been linked to the rising obesity prevalence.

SES comprising a person's income, education level, and occupation have an effect on health and health outcomes. It is one of the SDOHs that contribute to inequities in care.⁴ Health inequities affect health status among different groups.⁵ The inequities affect how people access care and care outcomes. Different researchers have shown that SES predicts diabetes onset and progression, affecting an individual's ability to access healthcare, healthy food, proper housing, and other resources that are pertinent to good health outcomes.^{3,6,7} Because of the important role that SES plays in healthcare, developing interventions geared toward attaining health equity is a measure for addressing the rising disease prevalence. The fact that SES and other SDOHs contribute to inequality and vulnerability means there is a need to design intervention measures that are geared toward addressing these factors to improve diabetes management and prevent disease progression. Doing this will provide better opportunities for improving diabetes management among the affected population. This review will investigate the impact of SES on diabetes prevalence and whether the different aspects of SES, namely, income, education level, and occupation, affect how a person manages the disease. The review will also investigate whether SES contributes to diabetes progression and complications, including morbidity and mortality rates.

SES and Diabetes

Research in recent years has linked SES to different health conditions such as diabetes, cardiovascular disease, low birth weight, cancer, and hypertension, among others.^{5,8} With regard to diabetes, research has shown that SES increases diabetes prevalence, with individuals from low SES being at a higher risk of the disease and its complications.⁹ SES determines an individual's ability to access healthcare, afford medical care, engage in health behavior, and environmental exposure, all of which are important determinants of health.⁵ SES is measured in terms of economic resources and power. It is a multidimensional construct made up of factors such as income, education, and occupation (Figure 1), all of which have unique implications for health.³ For instance, an individual's employment status determines their ability to afford healthcare, food, housing, and education, all of which have implications

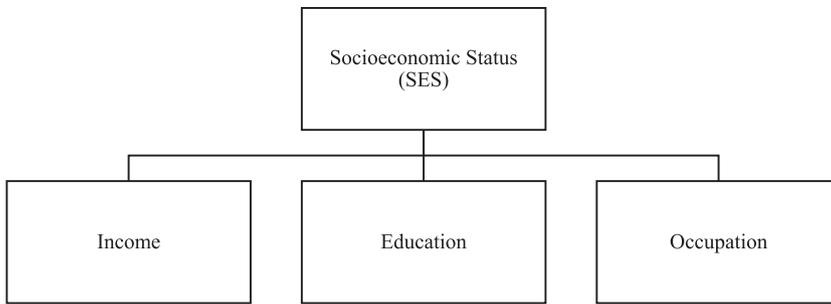


Fig 1 | Socioeconomic status components

on health outcomes. A person who does not have a stable occupation is likely to experience health inequities and disparities. A person's income affects their ability to afford basics such as housing, food, and healthcare, which can contribute to stress, affect health outcomes, and increase the likelihood of conditions such as diabetes and heart disease. It is well documented that SES affects health outcomes, affecting disease onset and progression at different levels, including individual, community, and population. Therefore, SES can affect both diabetes prevalence and management.

Components of SES

Education

Education is one of the SES components that affects health and health outcomes.

Research has shown that education affects life expectancy and morbidity.^{10,11} People who have high educational levels are expected to live longer than high school dropouts or those with lower educational levels.^{10,11} Hill-Briggs et al.,³ note that educational status is assessed at the individual, the household, or the community level. At the individual level, educational status is measured in terms of the person's educational attainment. At the household level, educational status is measured in terms of the highest grade completed by any member within the household, while at the community level, it is measured in terms of the highest percentage of high school or college graduates within the community.³

Educational status has an important implication on health because it influences different socioeconomic factors such as income and employment, which determine one's ability to afford healthcare, food, housing, and other basics that are instrumental in health outcomes.¹² The ability to afford these basics has been linked to better health outcomes. Lower educational attainment leads to negative outcomes. This is because they lack the economic power that is necessary to afford these necessities. Besides, the lack of the ability to afford basics such as housing, food, and healthcare exposes one to life stressors such as crime, violence, and food insecurity, which increase the likelihood of obesity, diabetes, and cardiovascular disease.

Education is also an important SDOH because it equips an individual with knowledge and skills that are necessary to manage disease, also known as health literacy. Research in recent years has shown that

health literacy leads to better health outcomes. Health literacy reduces the rates of hospitalizations, improves health status, increases adherence to medications, improves management of chronic conditions, and improves overall health and well-being.¹³ For individuals with diabetes, literacy is important in self-management and care. Individuals who have low literacy levels are more likely to have worse glycemic control, higher rates of diabetes retinopathy, and an increased risk of diabetes-related complications.^{14,15} Low health literacy leads to poor outcomes for diabetic patients because it affects their ability to practice self-care, ability to seek care, and medication adherence. All these are likely to lead to a higher risk of developing complications and poor outcomes.

Occupation

Occupation is an additional SES variable that has significant implications on health.

According to Hill-Briggs et al.,³ occupation is multidimensional and is measured through measures such as employment status, job stability, job type, and working conditions. An individual can be employed or unemployed. They can also be doing manual or non-manual labor. Job stability is measured in terms of job security. Working conditions refer to factors such as job demands, number of hours worked in a day, or type of work. All these factors play an instrumental role in determining health outcomes. Different occupational measures have an impact on health outcomes. For instance, employment status affects one's ability to afford and access healthcare, live in good neighborhoods, and afford healthy food. Long unemployment duration increases the likelihood of poor health outcomes.¹⁶ Unemployment also affects mental health, with long durations of unemployment being associated with poor outcomes on mental health.¹⁷ Employment status also affects health outcomes because it allows people to achieve economic stability. Individuals who have stable employment and job security are also more likely to report positive health outcomes, with job insecurity being linked to poor mental health outcomes.¹⁸ Working conditions and job type also have an impact on health and health outcomes.¹⁹

Income

As a component of SES, income plays an important role in health because it influences a person's ability to purchase healthcare, afford housing, and get better nutrition.⁵ It is also a measure of economic stability, with better economic stability being likely to lead to good health outcomes.²⁰ Research has documented an association between income and health outcomes.¹² Households with incomes below the federal poverty level report a higher likelihood of illness and premature death.¹² The federal poverty level in this case is the measure of annual income levels that determine financial eligibility criteria for different government programs and benefits. Individuals with lower income levels report poor health outcomes because the level of income determines an individual's ability to afford the

economic resources that are necessary to lead a healthy life. Such individuals are more affected by health disparities and face more inequities. They are also more affected by stressors such as housing insecurity, crime, lower education levels, and poor working conditions, all of which lead to negative health outcomes.

Growing research evidence indicates that income disparities are increasingly contributing to chronic conditions.^{21,22} Individuals from low-income households are predisposed to developing chronic diseases, including diabetes, and having poor outcomes.²³ They are less likely to access care or have medical insurance, which limits their ability to access medical care. In addition to affecting accessibility to care, income inequalities make it difficult to afford healthy food and good housing, all of which have been linked to poor health outcomes.

SES and Diabetes Prevalence

Research has shown an association between the different components of SES and diabetes prevalence.³ According to a study by Connolly et al.,⁶ diabetes prevalence increased or was higher in more deprived areas compared to more affluent areas. Deprived areas had lower income levels, lower education attainment, poor housing and neighborhood conditions, overcrowding, and high unemployment. Living in deprived areas is associated with poor health outcomes because of healthcare inequality and disparities that make it difficult to access care. Similarly, an epidemiological study examining country-level data from 130 different countries showed a link between SES and diabetes prevalence.²⁴ However, in this study, only the per capita income variable showed a significant correlation between SES and diabetes.²⁴ An increase of 1% in per capita income increased the likelihood of developing diabetes by 0.92%.²⁴ No significant association between employment status and diabetes prevalence was shown.²⁴ The association between low SES and diabetes prevalence has been shown by different researchers.^{25,26} The likelihood of developing diabetes among individuals from lower SES is high because of limited access to care and lower healthcare utilization, which makes it difficult to address diabetes risk. Diabetes is also attributed to lifestyle. Poor health-related behaviors increase the risk of developing diabetes. Some of these behaviors are smoking, excessive alcohol consumption, inadequate physical activity, and eating food that is high in sugar. Exposure to these behaviors increases the risk of early diabetes onset. Among individuals of different SES, behavioral lifestyles differ greatly, which may explain why individuals from lower SES may be more predisposed to developing diabetes. For instance, lower SES is a risk factor for smoking and lack of physical activity.^{27,28} Individuals who have lower SES are also likely to have lower income, lower educational attainment, and uncertain occupational status, which are linked to the likelihood of developing diseases, including diabetes. The link between different components of SES and diabetes prevalence is discussed in detail as follows.

Income

Income is one of the components of SES that has been linked to increasing diabetes prevalence, with the prevalence increasing as income decreases.^{3,29} According to a study done by Beckles and Chou,³⁰ diabetes prevalence increased as socioeconomic disadvantage increased and widened over time during the study's duration.³⁰ Another study by Dinca-Panaitescu et al.,³¹ showed that diabetes prevalence increased as income decreased. The highest diabetes prevalence was reported in the group with the lowest income (4.14 times higher).³¹ This evidence supports that diabetes prevalence decreases as income goes up. Having a low income is more likely to increase diabetes risk.³¹ The findings are supported by another study by Bird et al.,³² that showed diabetes prevalence was related to household income. In this study, individuals with a yearly income of \$29,999 had a diabetes prevalence of 9%. This was higher than 4.3% in households making between \$30,000 and \$79,999 per year. The prevalence went down further in households making over \$80,000 at only 2.7%.³²

Different factors explain why diabetes prevalence increases as income declines. Income affects different aspects of care, such as healthcare utilization and access to medical care.³² Lack of medical insurance affects healthcare coverage and makes it difficult to access the necessary specialty care. According to a diabetes survey done in 2010, people who did not have insurance were at a higher risk of developing diabetes.³³ Having insurance was also associated with better quality of care irrespective of SES, race, or ethnicity. For diabetic patients, consistent care is necessary to have glycemic control and reduce complications. Support from a multidisciplinary team comprising dietitians, diabetes educators, medical specialists, and social workers can have better outcomes in diabetes management.²⁵ Diabetes prevalence in low-income groups can also be attributed to increased risk factors such as obesity. According to Rabi et al.,²⁵ obesity is a risk factor for developing diabetes, particularly among women. Individuals in low-income groups are at increased risk of developing obesity and subsequent diabetes. In low-income groups, this risk is attributed to poverty, which makes it difficult to afford healthy and nutritious food with the right calorie intake.³⁴

Education

Research has demonstrated that educational attainment is an independent factor for diabetes prevalence, with lower educational attainment being linked to higher diabetes prevalence.⁷ According to Borrell et al.,³⁵ people who had a college education were less likely to report lower diabetes. Individuals with a high school diploma or less had higher diabetes prevalence, 1.6 times more than those who had a bachelor's degree.³⁵ Similar findings were reported by Steele et al.³⁶ The risk of diabetes went higher as the level of education decreased.³⁶

Different factors explain why diabetes prevalence increases as educational levels decrease. Lower

educational attainment makes it challenging to manage glycemic levels, with one meta-analysis showing that lower educational attainment was associated with higher HbA1c levels.³⁷ Lower education attainment is also associated with lower literacy.⁷ Health literacy is an important SDOH, with lower literacy levels being linked to poor health outcomes. For individuals living with diabetes, health literacy is linked to better diabetes knowledge and better self-management. Having lower educational attainment can make it difficult to understand the provided information or knowledge that is necessary for diabetes management. They are also less likely to utilize diabetes resources and educational centers. Lower educational attainment also makes it challenging to turn information received into practical healthy behaviors that can lead to disease prevention. This could explain why diabetes prevalence is higher among individuals who have lower education attainment.

Occupation

Occupation is another component of SES that has an impact on diabetes prevalence.

Different studies and meta-analyses have shown that different occupational aspects such as employment status, job security, and type of work have an impact on diabetes prevalence.^{38–40} Ferrie et al.,³⁸ found an association between job insecurity and high diabetes risk. Those who reported high levels of job insecurity were 19% more likely to report a high risk of diabetes.³⁸ Shockey et al.,³⁹ found that diabetes prevalence was different by occupation, with factors such as job stress and shift work increasing the likelihood of developing diabetes. Overall, the study found that diabetes prevalence was 6.4%, with men (7%) being more likely to have the disease than women (5.6%).³⁹ The study also found that diabetes prevalence increased with age, with the lowest prevalence being reported among the youngest workers aged 18–24 years (1.1%) and the highest prevalence among the oldest workers aged 55–64 years (12.7%).³⁹ Working adults aged 65 years and older reported the highest diabetes prevalence (17.8%). Occupations that were associated with higher stress levels, higher levels of uncertainty, high physical and emotional demands,

and shift work had higher diabetes prevalence. For instance, law enforcement workers, protective service workers, and first-line emergency providers had the highest levels of diabetes prevalence.³⁹ Professions that were regarded as less stressful, such as law, working in media, and working in the science field, were associated with lower diabetes prevalence.³⁹ A summary of diabetes prevalence across different occupations and the nature of these occupations is shown in Table 1. Diabetes prevalence was also higher among adults who had obesity and less educational attainment.³⁹

Job-related stress and shift work are associated with a higher diabetes prevalence.³⁹ According to Bannai et al.,⁴¹ workers with long shifts comprising more than 45 h per week were 2.5 times at risk of developing diabetes compared to workers who worked fewer hours.

Shift increases diabetes risk because of factors such as poor sleep patterns, a higher likelihood of taking unhealthy foods, poor glycemic control, and an increased risk of overweight and obesity.^{42,43} Shift work is also associated with higher job-related stress than non-shift work.³⁹ Job-related stress predisposes a person to diabetes. The type of occupation also plays a role when it comes to diabetes prevalence. High-demanding and stressful jobs in transportation, manufacturing, and protective services have also been associated with higher diabetes prevalence.^{39,40} A summary of how the three SES components increase diabetes prevalence is provided in Figure 2.

SES and Diabetes Management

Effective diabetes management is vital because it reduces diabetes-related complications and improves health outcomes. However, health inequalities and disparities associated with SES affect the ability of people living with diabetes to manage the condition effectively. Research has shown that poor diabetes management increases the risk of developing long-term diabetes complications.⁴⁴ Lower SES predisposes one to poor diabetes management. As evident in Figure 3, a complex interplay of SES factors affects diabetes management. For instance, low education attainment contributes to poor health literacy and affects diabetes self-management. Individuals who

Table 1 | Diabetes prevalence across different occupations and the nature of these occupations

Occupation	Diabetes Prevalence%	Nature of Occupation
Law enforcement workers	10.5	Stressful, high levels of uncertainty, working under pressure, shift work, highly physical, emotional demands, potentially dangerous
Protective service workers (including child protective services and adult protective services)	9.0	Stressful, highly demanding because of high caseloads, emotionally demanding, working in a crisis driven environment, exposure to secondary trauma
Nursing and psychiatric care	8.7	Shift work, stressful, emotionally demanding, challenges maintaining work-life balance
Transportation	7.3	Highly physical, stressful, long work hours, shift work, time pressure
Management occupations	5.5	Less stressful, less physical and demanding, office-based, high responsibility
Working in media	3.8	Less emotional demands, less physical demands
Legal profession (including lawyers, legal support workers, judges)	3.7	Less physical demands, less uncertainty, not characterized by shift work, less emotional demands

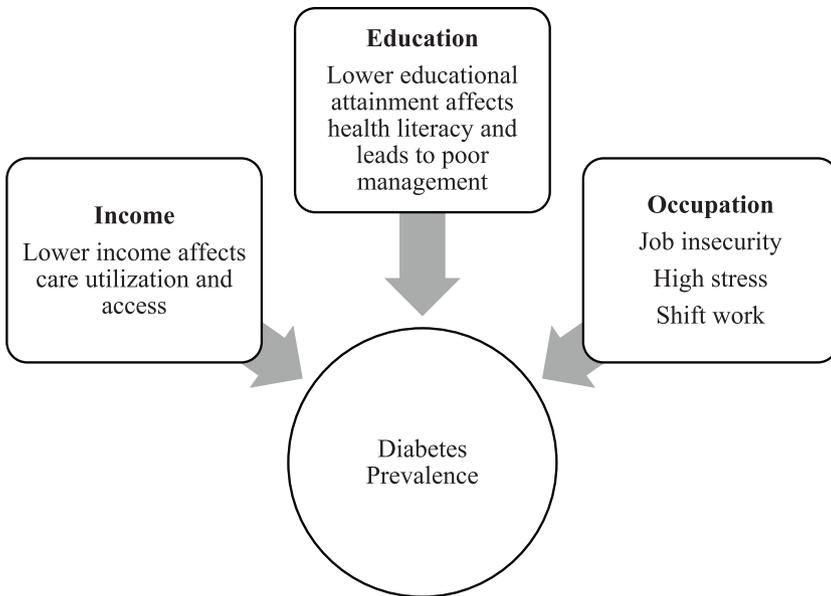


Fig 2 | A summary of how different components of socioeconomic status increases diabetes prevalence

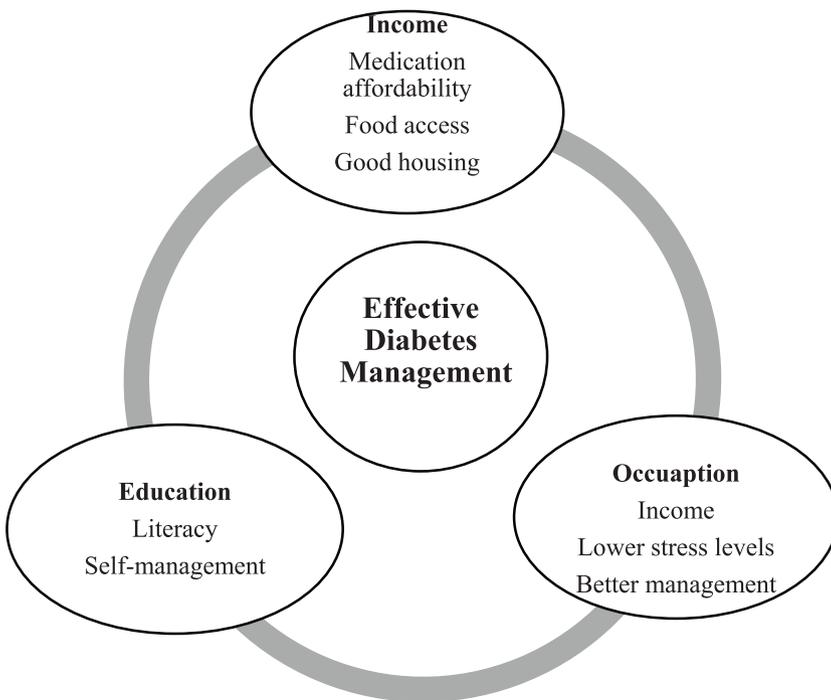


Fig 3 | Complex interplay between socioeconomic status and diabetes management

have low educational attainment experience difficulties in accessing and understanding diabetes-related information, which affects their ability to self-manage the disease.

Individuals with low SES are also likely to have poor glycemic control.⁴⁵ These individuals used measures such as avoidance coping to deal with stressful events during their diabetes journey. Avoidance coping resulted in high HbA1c levels. Similar findings were established by Kurani et al.⁴⁶ According to this study, diabetes patients living in areas that were

most deprived and rural areas were less likely to have high-quality diabetes care compared to those living in less deprived and urban areas.⁴⁶ Living in socioeconomically deprived areas was associated with poor diabetes care because of the present obstacles. People living in these areas were likely to have lower educational attainment, lower income, living in crowded housing, and from single-parent households.⁴⁶ Such factors have been associated with high diabetes prevalence and an increased likelihood of diabetes complications.

Deprivation is associated with poor diabetes management because it affects the ability to access the right medical and specialty care.⁴⁷ Individuals living in deprived areas have fewer financial resources, which makes it difficult to afford medical insurance and subsequent care. For people living with diabetes, medical insurance is instrumental in accessing high-quality care.⁴⁷ Individuals with medical insurance are more likely to go for foot examinations, eye examinations, and other preventative services. Deprivation is also associated with a greater comorbidity burden, high food insecurity, and lower health literacy, all of which have negative effects on diabetes management.

Policy Implications

Evidence from this review shows that there is an association between different SES components, namely, income, education, and occupation status, with diabetes prevalence and poor disease management. Inequities contribute to disparity in care, with individuals from low socioeconomic backgrounds being more likely to have high diabetes prevalence and poor diabetes management. As such, there is a need for policies in place to mitigate the negative effects of low SES on diabetes prevalence and management. For instance, providing funding for diabetes education programs can improve health literacy and diabetes self-management. Research shows that these education programs work and lead to positive outcomes when it comes to diabetes care and self-management.^{48,49} Some of the benefits associated with diabetes education include improved glycemic control, slower onset of diabetes-related complications, improved quality of life, reduced diabetes healthcare costs, and improved self-efficacy when it comes to diabetes management.^{48,50,51}

Improving access by increasing insurance coverage and addressing the existing insurance gaps can also lead to positive outcomes. Income inequalities affect the ability to afford care, with people from low-income quintiles being more likely to report higher diabetes prevalence, increased rates of diabetes complications, and poor disease management.^{33,47} There is evidence that increasing insurance coverage and addressing the existing insurance gaps can improve disease outcomes.⁵² For instance, the Affordable Care Act led to an increase in insurance coverage among people with low family incomes (below <\$35,000) and those with low educational attainment between 2009 and 2016.⁵³ Improving insurance coverage lowers diabetes-related

care costs, particularly out-of-pocket costs, which contribute significantly to poor medication adherence.⁵⁴

Conclusion

The reviewed studies establish that SES has an impact on both diabetes prevalence and management, supporting evidence that shows an association between SDOH and disease prevalence and outcomes. Different SES components, such as income, occupation, and educational attainment, have both direct and indirect impacts on diabetes. They increase the risk of getting the disease and increase the likelihood of poor disease management. Living in resource-deprived areas contributes to disparities in diabetes risk and outcomes. This explains why individuals with lower educational attainment and lower income levels have higher diabetes risk and an increased likelihood of poor outcomes. Although this review documents that SES has an impact on diabetes prevalence and management, it is important to acknowledge that the pathways that show an association between different SES components are challenging and complex. Therefore, the different components of SES could exert their effects on diabetes in complex ways.

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