



Key issues surrounding the management of non-communicable diseases including the management of diabetes post COVID-19 among developing countries with a specific focus on Bangladesh

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There continues to be high and continued growth in the prevalence of non-communicable diseases (NCDs) across low- and middle-income countries (LMICs), which is a concern. Currently, over 41 million people globally die each year from NCDs, and growing, with the greatest shift in disease burden, including mortality, from communicable diseases to NCDs among African and South Asian countries

(Khanam *et al.*, 2019). For instance in Bangladesh, deaths due to NCDs increased from 43.4% of total deaths in 2000 to 66.9% in 2015 (Rawal *et al.*, 2019). It has been estimated by 2025 that nearly 30% of adults globally will have hypertension estimated at 1.5 billion people (Khanam *et al.*, 2019, Legido-Quigley *et al.*, 2019), with these figures likely to be an under-estimate with the recent COVID-19 pandemic and associated lockdown measures (Ahmed *et al.*, 2020, Kluge *et al.*, 2020, Mistry *et al.*, 2021), further increasing morbidity and mortality. There are similar concerns with patients with diabetes mellitus. Globally in 2019, there was an estimated 463 million people worldwide with diabetes mellitus (Chan *et al.*, 2021, Liu *et al.*, 2020), with these rates expected to grow unless addressed (Godman *et al.*, 2021a). However, the International Diabetes Federation (IDF) recorded higher rates globally at 537 million adults aged between 20 and 70 years, i.e., approximately one in ten adults, with this figure expected to rise to 643 million by 2030 unless addressed (IDF, 2021a).

The increase in morbidity and mortality due to NCDs, including diabetes and hypertension, among LMICs, including African and South Asian countries, has been exacerbated by a number of key factors. These include increasing urbanisation, concerns with access to diagnosis and treatment facilities exacerbated by high co-payment levels and resource issues, family history, ageing populations, dietary habits and limited education (Alam Miah and Yousuf, 2018, Bhuyan and Fardus, 2019, Fottrell *et al.*, 2018, Godman *et al.*, 2020, Kibria *et al.*, 2018, Macquart de

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Terline *et al.*, 2019). In addition, continued high tobacco consumption including among African and Asian countries further aggravates the condition (Rafique *et al.*, 2018, Hango *et al.*, 2021). This includes Bangladesh where up to 44.7% of men smoke (Burki, 2019, Rafique *et al.*, 2018), highest in the slum population of Dhaka City (Khandker *et al.*, 2017). However, this may start to change with new tobacco laws and the introduction of smoke-free places in Bangladesh as well as monitoring of the implementation of the Tobacco Control Act by local regions in Bangladesh (Tobacco Control Laws, 2021). Overall, NCDs including hypertension and diabetes are particularly prevalent in LMICs, which need urgently to be addressed to reduce future morbidity and mortality (Khanam *et al.*, 2019).

Within Bangladesh, Rahman *et al.* (2018) estimated that 20% of the adult population have hypertension (Rahman *et al.*, 2018). Fottrell *et al.* (2018), Khanan *et al.* (2019) and Chowdhury *et al.* (2020) in their systematic review and meta-analysis reported similar prevalence rates (Khanam *et al.*, 2019, Chowdhury *et al.*, 2020, Fottrell *et al.*, 2018), with Hassan *et al.* (2021) recently reporting higher rates of hypertension among urban and rural areas of Dhaka (Hasan *et al.*, 2021). Overall, prevalence rates for hypertension are likely to rise certainly in the short to medium term in Bangladesh unless addressed (Chowdhury *et al.*, 2020). This is without taking into consideration the impact of COVID-19 on the diagnosis and management of hypertension through lockdown and other activities (Kluge *et al.*, 2020).

In their study, Fottrell *et al.* (2018) also found that the combined prevalence of impaired fasting glucose and glucose intolerance alongside diabetes among the population in Bangladesh was 34.9% among women and 26.1% among men, with both increasing with age (Fottrell *et al.*, 2018). Mistry *et al.* (2021) estimated that nearly 60% of surveyed elderly in Bangladesh had at least one NCD with one-quarter having multimorbidities (Mistry *et al.*, 2021). Overall, an estimated 8.4 million adults aged between 20 and 79 in Bangladesh have diabetes, with the number of patients with diabetes projected to rise (Afroz *et al.*, 2019a). The International Diabetes Federation in their latest publication suggest this could be as high as 16.8 million adults in 2030 in Bangladesh and 22.3million by 2045 unless addressed, enhanced by an estimated 43.5% undiagnosed (IDF, 2021b). There are generally appreciable rates of misdiagnosis of diabetes in Southeast Asia, including Bangladesh, due to many people not being included in any coverage programme (Shariful Islam *et al.*, 2017). COVID-19 itself can potentially increase the number of people who develop type 1 diabetes (T1DM) (Steenblock *et al.*, 2021). Alongside this, impairment of islet function should be considered in patients with metabolic disorders following COVID-19 as this virus can increase the

potential for these patients to develop T2DM (Maestre-Muñiz *et al.*, 2021, Steenblock *et al.*, 2021, Accili, 2021).

High prevalence rates for NCDs including diabetes and hypertension have appreciable economic consequences. In the case of patients with diabetes, the cost of associated complications has increased the global economic burden from US\$1.3 trillion in 2015 to an estimated US\$2.1 to US\$2.5 trillion by 2030 (Bommer *et al.*, 2018, Mapa-Tassou *et al.*, 2019). This includes both direct and indirect costs, and equates to an average of 2.2% of Gross Domestic Product (GDP), with most of these costs being indirect costs (Bommer *et al.*, 2018, Mapa-Tassou *et al.*, 2019). The cost of complications is enhanced by their high prevalence rates if inadequate preventative measures (Chan *et al.*, 2021). In their recent study, Afroz *et al.* (2019a) found that among 1253 patients with type 2 diabetes (T2DM) surveyed in six hospitals in Bangladesh, the prevalence of strokes was 10.1%, coronary artery disease 30.5%, diabetic foot ulcerations 12.0%, nephropathy 34.2%, retinopathy 25.1% and neuropathy at 5.8% of patients (Afroz *et al.*, 2019b).

The costs of care are particular concern in countries such as Bangladesh due to high rates of patient co-payments (Rahman *et al.*, 2020, Khan *et al.*, 2017, Haque *et al.*, 2021a). In their study, Shariful Islam *et al.* (2017) estimated that the total annual per capita expenditure on medical care among patients in Bangladesh was 6.1 times greater for those with diabetes versus those without diabetes (Shariful Islam *et al.*, 2017). Afroz *et al.* (2019) calculated that the costs of medicines contributed the greatest amount to the overall direct costs of treating patients with diabetes in Bangladesh (60.7%) followed by the costs of hospitalisations (27.7%) (Afroz *et al.*, 2019a). Greater proactivity in managing these patients in Bangladesh will bring considerable improvement in patient outcomes alongside net economic benefits given the current high costs of managing patients with NCDs including those with diabetes and hypertension (Nugent *et al.*, 2017, Afroz *et al.*, 2019a).

We are aware that whilst the Government in Bangladesh has launched many NCD-related programmes and policies in recent years to improve the management of patients with NCDs, including those with diabetes and hypertension (Nugent *et al.*, 2017, Biswas *et al.*, 2017), there are concerns. Concerns include the fact that despite these initiatives there appears a lack of effective planning, implementation and monitoring (Biswas *et al.*, 2017). As a result, the burden of NCDs continues to grow in Bangladesh (Biswas *et al.*, 2017).

Typically in Bangladesh, patients with NCDs in the public sector, including diabetes and hypertension, may visit health complexes before referred to more specialist clinics (Rawal *et*

al., 2019). Whilst these services have improved in recent years, there are concerns generally with the lack of specific guidelines, trained personnel, laboratory facilities, and medicines including metformin and insulin for patients with diabetes, as well as typically poor recording of patients' treatments and reporting systems (Rawal *et al.*, 2019). This was emphasised in the study of Biswas *et al.* (2018) among health facilities throughout Bangladesh providing care for patients with cardiovascular diseases (CVD) and diabetes (Biswas *et al.*, 2018). The authors found a shortage of trained staff and a lack of adequate medicine supplies for patients with CVD (43.9%) and diabetes (23.5%). Overall, among the health facilities that offered care for patients with CVD and diabetes, less than 1% had all four designated service readiness factors including the availability of guidelines, trained staff and equipment as well as appropriate medicine (Biswas *et al.*, 2018). The availability and use of current guidelines is seen as especially important to improve future care (Campbell *et al.*, 2021, Niaz *et al.*, 2019). Similar findings were seen by Legido-Quigley *et al.* (2019) where patients with hypertension had concerns with accessing health care including medicines (Legido-Quigley *et al.*, 2019).

Encouragingly, we have seen in Bangladesh a growth in the availability of newer long-acting insulin analogues to help address issues of patient convenience and incidences of hypoglycaemia in recent years (Haque *et al.*, 2021a). This has been helped by the increasing availability of low cost long-acting insulin analogue biosimilars, different to the situation among a number of African countries including those with universal healthcare (Haque *et al.*, 2021a, Haque *et al.*, 2021b, Godman *et al.*, 2021a, Godman *et al.*, 2021b, Godman *et al.*, 2021c). However, as mentioned, there are concerns with diagnosis and monitoring of patients with diabetes including adherence to prescribed medicines. We have initiated a pilot study to explore this more closely starting with patients with T2DM in out-patient clinics of public hospitals as poor record keeping and monitoring will compromise future care. This builds on studies across Bangladesh and LMICs (Afroz *et al.*, 2019b, Mwita *et al.*, 2020, Mwita *et al.*, 2019, Chetoui *et al.*, 2020, Pinchevsky *et al.*, 2017).

In conclusion, there are considerable concerns with the current management of patients with NCDs across LMICs further aggravated by the recent COVID-19 pandemic. Suggestions for the Government in Bangladesh to improve the future management of patients with NCDs, especially those with diabetes, include prioritizing vulnerable populations through for instance subsidizing high costs of care for patients with NCDs when the need arises (Rahman *et al.*, 2020). In addition, improving diagnosis as well as access and availability to medicines to adequately treat patients with NCDs including those with T2DM (Ozawa *et al.*, 2019, Ewen *et al.*, 2019).

Alongside this, being proactive generally regarding the management of NCDs in line with suggested National programmes, with, as mentioned, such approaches estimated to provide appreciable net economic and healthcare benefits given current costs (Nugent *et al.*, 2017). Improved information technology can also help with data collection and analysis given the predominantly paper based approaches currently within Bangladesh with concerns with the adequate monitoring of patients (Islam, 2016). Furthermore, potentially exploring the utilisation of innovative technologies as well as greater use of telemedicine, including mobile telephones, to change patient behaviour, especially their lifestyles (Tabassum *et al.*, 2018). We will be exploring and monitoring a number of aspects in future studies.

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