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REVIEW ARTICLE

UAE Consensus on Patient Profiles for Pre-exposure Prophylaxis with Monoclonal Antibodies against COVID-19 in Hematological Malignancies and Immunocompromised States

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Abstract:

Introduction:

Despite significant advancements in COVID-19 treatment and prevention, immunocompromised individuals, particularly those with hematological malignancies, remain at high risk for severe infection and suboptimal vaccine response. Pre-exposure prophylaxis strategies for these vulnerable populations have been limited. Monoclonal antibodies, proteins designed to target specific antigens, offer a promising preventive solution for individuals unable to mount a sufficient immune response to vaccination. However, there is a critical unmet need to establish clear patient selection criteria for pre-exposure prophylaxis with monoclonal antibodies in these groups. This consensus statement explores recent research to address this gap, outlining profiles of patients most likely to benefit from monoclonal antibody-based prophylaxis.

Methodology:

The consensus statement was developed through a rigorous process, utilizing a pre-Delphi search method and a modified Delphi technique to gather expert opinions. This approach ensured a comprehensive and informed consensus among experts in the field. Initially, nine distinct patient categories requiring pre-exposure prophylaxis with monoclonal antibodies were identified. Through iterative rounds of expert feedback, discussion, and refinement, these nine categories were expanded and subdivided into twelve more specific groups of hematological malignancies and immunocompromised disorders. This refinement aimed to better capture the diverse patient profiles requiring prophylaxis, providing a more detailed framework for the targeted administration of monoclonal antibodies.

Results:

The study resulted in the panel members agreeing on nine categories for the use of monoclonal antibodies in COVID-19 prevention for high-risk patients. Achieving consensus among experts is crucial as it reflects the collective validation of evidence-based recommendations that can be reliably applied in clinical practice. A 100% agreement was reached for HIV and AIDS, underscoring the unanimous recognition of the vulnerability of this group to severe COVID-19 outcomes. Similarly, 96% agreement was reached for patients on immunomodulatory drugs (IMiDs), and 90.5% for those with hematological diseases, highlighting strong expert support for prophylaxis in these categories. Immunodeficiencies and renal conditions garnered 86% agreement, indicating broad, although slightly more varied, expert consensus on these groups. Lastly, 80% of the panel supported patients with solid organ cancer, liver conditions, rare neurological disorders, and severe life-limiting neuro-disabilities, reflecting recognition of their elevated risk despite more diverse opinions for these categories.

Conclusion:

This consensus statement offers healthcare professionals in the UAE a clear, evidence-based framework for the use of monoclonal antibodies in preventing COVID-19 among patients with hematological malignancies and immunocompromised conditions. By outlining specific patient categories, the statement provides a practical guide that enables clinicians to make informed decisions about pre-exposure prophylaxis, ensuring that high-risk individuals receive timely and appropriate protection. The consensus not only enhances the ability of healthcare providers to identify and prioritize at-risk populations, but also optimizes patient outcomes by streamlining preventive measures in clinical practice. In addition, these findings lay the groundwork for future research and the development of standardized protocols, ultimately improving the management of vulnerable populations in the ongoing fight against COVID-19.

Keywords: Prophylaxis, Monoclonal antibodies, COVID-19, Hematological malignancies, Immunocompromised states, HIV, AIDS.

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1. INTRODUCTION

1.1. Classification of Hematological Malignancies

Hematological malignancies primarily consist of acute leukemia, chronic leukemia, lymphoma, multiple myeloma (MM), myelodysplastic syndrome (MDS), and myelo-proliferative neoplasm (MPN) [1 - 3].

Acute lymphoblastic leukemia (ALL) is marked by the rapid proliferation of immature lymphocytes, making it a distinct entity within these malignancies [1]. Acute myeloid leukemia (AML) is the most common form of acute leukemia in adults worldwide, with its incidence increasing with age. AML is defined by a broad range of genetic mutations in hematopoietic stem/progenitor cells, leading to considerable disease heterogeneity [1 - 3].

Lymphomas are divided into two main categories:

• Hodgkin lymphoma (HL), which constitutes approximately 10% of lymphomas globally, and

• Non-Hodgkin lymphoma (NHL), which includes common subtypes, like diffuse large B-cell lymphoma (DLBCL), mantle cell lymphoma (MCL), and follicular lymphoma (FL) [3, 4].

HL is a rare lymphoma characterized by distinct histological and clinical features. It consists of two main subtypes: classical HL (cHL), accounting for 95% of HL cases, and nodular lymphocyte-predominant HL [5].

Multiple myeloma (MM), MDS, and MPN predominantly affect elderly individuals, with the median age of diagnosis around 70 years [6]. MM, which comprises roughly 10% of all hematologic malignancies, currently remains incurable [3 - 7]. MDS is characterized by ineffective hematopoiesis, with 30% of MDS cases eventually progressing to AML [6].

Chronic lymphocytic leukemia (CLL) or small lymphocytic lymphoma (SLL) is a slow-progressing malignancy defined by the overproduction of mature but dysfunctional B lymphocytes. CLL/SLL is classified as a monoclonal lymphoproliferative disorder, where abnormal B cells accumulate in the peripheral blood, spleen, lymph nodes, and bone marrow. CLL makes up 25-30% of all leukemia cases in the United States. In 2020, approximately 21,040 new cases and 4,060 deaths were projected for CLL in the United States, with global estimates reaching 191,000 cases and 61,000 deaths annually. CLL can occur in adults as young as 30 years old, though it is most commonly seen in those around the age of 70. The disease is slightly more prevalent in men than women, with male-to-female ratios ranging from 1.3:1 to 1.7:1, although studies suggest that women may experience a more aggressive form of the disease [8 - 11].

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1.2. Epidemiology Global overview

According to GLOBOCAN 2020 estimates, non-Hodgkin lymphoma (NHL) ranks among the nine most common cancers worldwide. The highest incidence rates are found in Eastern Asia, accounting for 24.9% of cases, followed by Northern America (15.1%), South-Central Asia (9.7%), and Western Europe (7.9%) [12]. High-income regions, like Australia, North America, and Europe, report the highest incidence rates, potentially due to better access to diagnostic resources, although the exact causes remain unclear [12] (Fig. **1**).

A study by Zhang *et al*. examined the global burden of hematological malignancies over 30 years and found that Qatar, the United Arab Emirates, and Cyprus had some of the most dramatic increases in leukemia incidence, with percentage changes ranging from 300% to 500%. These countries also experienced significant increases in multiple myeloma (MM) cases (800% to 1000%) and non-Hodgkin lymphoma (NHL) cases (700% to 1000%), along with the highest increases in lymphoma-related deaths [13]. Another study by Cai *et al*. analyzed trends in NHL from 1990 to 2019 using data from the Global Burden of Disease Study (GBD). The study showed that age-standardized rates (ASR) of disability-adjusted life years (DALYs) due to NHL ranged from 23.53 per 100,000 in Mali to 409.87 per 100,000 in Monaco, with the UAE experiencing the largest increase in DALYs, rising 561.34% during this period [14].

Globally, many regions face challenges in diagnosing and managing hematological malignancies due to disparities in healthcare infrastructure, limited access to advanced treatments, and variations in early detection efforts. In low-income regions, the lack of adequate diagnostic tools and treatment facilities often leads to delayed diagnoses and poorer patient outcomes. The COVID-19 pandemic has further exacerbated these challenges, as healthcare resources were diverted to address the pandemic, delaying cancer diagnoses and treatments across various regions [12 - 14].

1.3. Incidence Rates in the United Arab Emirates (UAE)

The UAE is a country of approximately 10 million people of which the majority (~80%) are expatriates. The data on hematologic malignancies in the UAE are compiled according to the latest WHO classification. The most recent publication was the 6th annual report of the UAE National Cancer Registry [15]. The UAE National Cancer Registry (UAE-NCR) collects demographic, cancer, staging, clinical, and treatment information for all cancers diagnosed in the UAE, following internationally accepted registration and coding standards that are WHO-based, unless otherwise specified. For both UAE citizens and non-UAE citizens in the country, all malignant and *in situ* cases diagnosed in the UAE between January 1st and December 31st, 2019, were reported and recorded in the UAE National Cancer Registry.

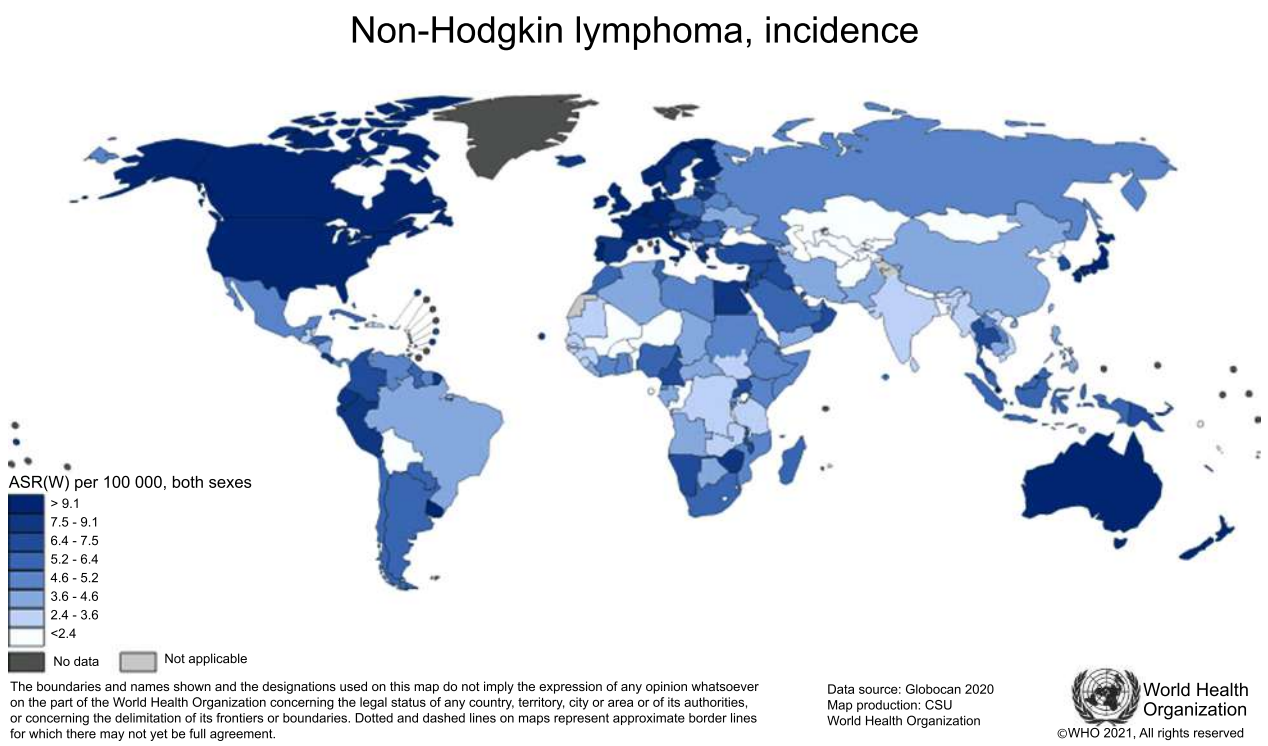

Fig. (1). Non-hodgkin lymphoma incidence based on the WHO report from GLOBOCAN data source 2020 [13].

The ratio of solid cancers to hematologic malignancies is somewhat skewed, with a slightly higher proportion of hematologic malignancies in the UAE [15]. According to the 2019 data from the UAE National Cancer Registry by the Ministry of Health and Prevention (MOHAP), leukemias and non-Hodgkin's lymphomas are the 5th and 6th leading cancers in the UAE [16].

A study conducted by ALShamsi *et al*. mentioned leukemia and non-Hodgkin's lymphoma as the top-ranked cancers among males in the UAE. The study also indicated that for children, leukemia and non-Hodgkin's lymphoma are the most common cancers in boys and girls. The study also showed an increase in cancer incidence irrespective of gender within the age group between 20-49 years, accounting for a percentage of 4-5% since 2015 [17].

IB Hassan *et al*. provided evidence that found a statistically significant higher incidence of AML among UAE females than in UAE males ($p = 0.04$). This was reflected in a significantly higher incidence of AL ($p = 0.02$) and AML ($p = 0.02$) among females when compared to males in the total population of the UAE [18].

1.4. Treatment Advances

Recent advancements in chemotherapy, radiotherapy, and targeted therapies have significantly improved overall response rates (ORR) in patients with hematological malignancies [3]. Traditionally, treatment has relied on a combination of multiple drugs to manage both pediatric and adult cases. However, despite these advancements, treatment failures often due to relapse and drug resistance have continued to present significant challenges for many patients over the past decade [3, 18].

Immunotherapy, particularly B-cell depletion therapies, such as rituximab, obinutuzumab, ofatumumab, and veltuzumab, has emerged as a promising strategy for achieving prolonged remission in patients with refractory or relapsed (R/R) hematological malignancies. These therapies have demonstrated remarkable efficacy in clinical practice, marking a significant shift in cancer treatment [3, 18, 19]. The immunotherapeutic targeting of hematological malignancies is uniquely effective due to the constant interaction between immune cells and cancer cells within the hematopoietic system, which promotes immune surveillance [3]. This alignment with the immune system's cellular origins makes these malignancies particularly susceptible to immunotherapy [3].

However, this benefit is accompanied by risks. The disease and its treatments can lead to immune suppression, making patients vulnerable to infections, such as COVID-19, which can result in severe outcomes, like hospitalization [20 - 24]. B-cell depletion therapies, while effective, may impair immune responses, further heightening the risk of infection. In light of these challenges, continued advancements in immunotherapy are crucial for improving treatment outcomes, especially in high-risk, immunocompromised patients.

Over the years, immunotherapy has expanded to include various innovative approaches aimed at harnessing the patient's immune system to fight cancer. These therapies have become a cornerstone in the treatment of CD20-expressing lymphoid malignancies, offering a well-established efficacy and safety profile in patients with hematological cancers [3, 19 - 25].

1.5. Potential Risks and COVID-19 Prophylaxis in Cancer Patients

Cancer patients, particularly those with hematological malignancies and lung cancers, are at a significantly higher risk of severe COVID-19 outcomes compared to the general population. These outcomes include higher rates of hospital admissions, ICU admissions, and mortality [25]. Patients with hematological malignancies are especially vulnerable due to their compromised immune systems and the immuno-suppressive effects of their treatments, which make them more susceptible to severe and life-threatening infections. Current evidence suggests that patients with lymphoproliferative disorders, such as non-Hodgkin's lymphoma, chronic lymphocytic leukemia, and multiple myeloma, face an even greater risk of contracting SARS-CoV-2 [26].

Research efforts have focused on the development of monoclonal antibodies (mAbs) to mitigate this risk. These antibodies, often derived from B cells of recovered COVID-19 patients or produced by immunizing humanized mice, have shown potential in combating SARS-CoV-2. Monoclonal antibodies can be generated by isolating immunoglobulin genes and producing pathogen-specific antibodies, typically in the form of IgG, using advanced techniques [27].

While vaccines remain at the forefront of COVID-19 prevention, patients with hematological malignancies exhibit a suboptimal response to vaccination, leading to higher mortality rates even after receiving vaccines. Breakthrough cases of COVID-19 in this population further underscore the need for additional prophylactic measures [28]. This has led to the increasing use of monoclonal antibodies as an adjunct to vaccines, especially for high-risk individuals.

One notable example is AZD7442, a combination of the monoclonal antibodies tixagevimab and cilgavimab, which has shown promise as both pre-exposure and post-exposure prophylaxis [29]. In the PROVENT study, the combination of tixagevimab and cilgavimab demonstrated a 76.7% relative risk reduction in symptomatic COVID-19 infections compared to placebo in high-risk patients [26]. This result is particularly significant for individuals with hematological malignancies, who often exhibit reduced antibody responses due to their underlying conditions or treatments, like BTK inhibitors, CAR-T cell therapy, and anti-CD20 therapies. Monoclonal antibodies have thus emerged as a crucial tool for prophylaxis in these immunocompromised populations.

Additional data from other relevant studies further support the efficacy of monoclonal antibodies in preventing COVID-19 in high-risk patients. For instance, the TACKLE trial reported that AZD7442 (tixagevimab/cilgavimab) reduced the risk of severe COVID-19 or death by 50% in non-hospitalized patients with mild to moderate symptoms [28]. This trial included a substantial number of immunocompromised individuals, emphasizing the potential of monoclonal antibodies in reducing the severity of COVID-19 in these vulnerable populations [30].

Moreover, the STORM CHASER study evaluated AZD7442 for post-exposure prophylaxis and found that it provided significant protection against symptomatic COVID-19, especially in patients who were unable to mount a sufficient immune response to vaccination [26, 31, 32]. This study included individuals with hematological malignancies, who are often unable to benefit fully from vaccines alone due to their impaired immune systems. The data from these studies reinforce the consensus that monoclonal antibodies offer an additional layer of protection, particularly for patients with compromised immunity, further justifying their inclusion in pre-exposure prophylaxis strategies.

Additional research is needed to assess whether vaccine booster strategies can enhance immune responses in this vulnerable population. However, the current evidence supports the need for new preventive approaches, including pre-exposure monoclonal antibodies, to protect high-risk patients with hematological malignancies from severe COVID-19 complications [32 - 34].

2. METHODS CONSENSUS PLANNING

The consensus was developed in response to the significant variability in clinical practices regarding the identification of patients eligible for monoclonal antibody (mAb) prophylaxis against COVID-19. Clinicians face numerous challenges, including the lack of standardized criteria for selecting high-risk patients with hematological malignancies and immunocompromised conditions. Given these challenges, establishing a unified consensus was essential to provide clear, evidence-based guidance.

2.1. Expert Panel Recruitment

Between September 2023 and February 2024, a pre-Delphi search and a three-step modified Delphi technique were utilized to reach the current consensus. The process involved two cycles of blind voting by a panel of experts, followed by an in-depth discussion meeting. This iterative approach was necessary to refine the recommendations and ensure that they reflect the collective expertise of specialists in the field. The resulting consensus statements aimed to address inconsistencies in current practice and provide clinicians with a structured approach to patient identification for mAb prophylaxis, ultimately improving clinical outcomes.

Nine specialized hematologists and infectious disease specialists from the UAE were independently nominated by the Emirates Society of Hematology with established research profiles in the field of hematology. Experts were contacted *via* email and invited to participate in the three stages of this Delphi method-based study. By establishing a panel with a size that could promote effective discussion and limiting participation to experts from the UAE, the aim was to enhance the rigor and relevance of the study findings. This approach allowed for meaningful consensus-building while also acknowledging the unique context of the UAE healthcare system.

2.2. Survey Development

To gather relevant material for survey development with the committee, we first identified the indications, signs, and symptoms that are more prevalent in COVID-19-diagnosed cases using a rapid literature review search. This process involved the development of a preliminary set of survey items based on identified themes in the literature.

2.2.1. Literature Selection Process

A comprehensive literature search was conducted using Google Scholar, Scopus, and PubMed databases. The following keywords were used to find potentially eligible literature: ["pre-exposure prophylaxis" (MeSH terms) OR "treatment" OR "therapy"] AND ["consensus statement" (MeSH terms) OR "expert opinion" OR "guidelines"], [("HIV pre-exposure prophylaxis" OR "COVID-19 treatment") OR ("Kidney disease pre-exposure prophylaxis" OR "liver disease pre-exposure prophylaxis" OR "cancer pre-exposure prophylaxis" OR "immune deficiency pre-exposure prophylaxis")] AND ("consensus statement" OR "expert opinion").

2.2.1.1. Inclusion Criteria

2.2.1.1.1. Types of Studies

Peer-reviewed articles, consensus statements, expert opinions, and clinical guidelines relevant to COVID-19 treatment and pre-exposure prophylaxis.

2.2.1.1.2. Population Focus

Studies that specifically address populations at higher risk for severe COVID-19 outcomes, including those with underlying health conditions, such as HIV, kidney disease, liver disease, cancer, or immune deficiencies.

2.2.1.1.3. Language

Articles published in English to ensure comprehension and accurate interpretation of findings.

2.2.1.2. Exclusion Criteria

2.2.1.2.1. Types of Studies

Studies not directly addressing COVID-19 treatment or pre-exposure prophylaxis.

2.3. Voting Rounds

The consensus document was developed through a structured three-stage process. Initially, a draft survey was created, consisting of a series of statements, questions, or attributes, based on which respondents rated their agreement on a scale of 1 to 5. This survey was circulated to experts *via* email in the first step. Experts were prompted to express their level of agreement, choosing from options ranging from "strongly agree" to "strongly disagree" for each statement.

2.3.1. Disagreement Resolution and Statement Revisions

In cases where a statement did not achieve the predetermined agreement threshold of 80%, the following steps were taken to address disagreements and guide revisions:

2.3.1.1. Identification of Discrepancies

Statements that failed to reach the 80% agreement threshold were flagged for further discussion. Experts were encouraged to provide comments, suggestions, and rationales for their ratings, allowing for a clearer understanding of differing perspectives.

2.3.1.2. Amendment or Omission

Experts retained statements that did not meet the agreement threshold for stage 2 and were tasked with either amending or omitting them. Each expert's feedback was reviewed collectively to identify common themes or areas of contention, which guided the revisions.

2.3.1.3. Hybrid Advisory Board Meeting

On November 13, 2023, a hybrid advisory board meeting (both virtual and on-site) was held. During this meeting, experts collaboratively discussed the remaining statements, facilitating a dialogue aimed at resolving disagreements. This interaction allowed for the negotiation of terms and clarification of intent behind specific statements.

2.3.1.4. Final Consensus on Revised Statements

The panel sought to achieve an 80% agreement on the revised statements during this meeting. Any items that continued to lack consensus were further adjusted or considered for deletion based on the discussions held, ensuring that all voices were heard and that the final statements reflected a unified expert opinion.

2.3.1.5. Final Voting Phase

The revised list, now consisting of 73 statements within 9 main categories, was sent back to the experts for voting in the final phase. The Delphi workbook, developed using Microsoft Excel 2016 MSO, included a response-controlled questionnaire. The Delphi administrator anonymized responses and utilized summary statistics to evaluate variable consensus.

Throughout this process, the Delphi study adhered to a consensus level of ≥80%, in alignment with CREDES (Conducting and Reporting of Delphi Studies) Guidance [30]. The final consensus statements were further refined based on guidelines from the United Kingdom's Department of Health and Social Care (DHSC) and the United Kingdom Clinical Expert Consensus Statement on monoclonal prophylactic antibody therapies [35].

2.3.2. Assessing Consensus and Variability

To enhance transparency and replicability in our Delphi study, we utilized straightforward statistical methods to assess variability and establish consensus. Experts rated each statement on a scale of 1 to 5, and we calculated the mean score for each statement to determine the overall agreement among participants. Our initial consensus threshold was set at 80%, and we also examined the frequency of agreement, specifically the percentage of experts who rated statements as 4 or 5, as an additional indicator of consensus. To assess variability, we calculated the standard deviation for each statement; a lower standard deviation indicated that experts had similar opinions, while a higher standard deviation suggested more disagreement. Statements not meeting the 80% agreement threshold were revised based on expert feedback, followed by a second round of voting where we repeated the analysis to check if the changes led to improved agreement. For the final consensus, we required that revised statements achieve both the

80% agreement and a lower standard deviation than in the previous round, indicating reduced variability and greater alignment among the experts.

3. RESULTS AND DISCUSSION

The results of the Delphi survey are presented in Table **1** (appendix **A**).

Individuals who have weakened immune systems are at a higher risk of experiencing severe consequences if they contract SARS-CoV-2. Immunocompromising conditions refer to health conditions or medications that suppress either humoral or cellular immunity. Patients with such conditions are more vulnerable to the effects of the virus.

Examples include the following:

• Active definitive treatment for solid tumor and hematologic malignancies.

• Chimeric antigen receptor (CAR) T-cell therapy or hematopoietic stem cell transplant (HSCT).

• Receipt of a solid organ transplant and taking immunosuppressive therapy.

• Moderate or severe primary immunodeficiency (*e.g.*, DiGeorge syndrome, Wiskott–Aldrich syndrome).

• Advanced or untreated human immunodeficiency virus (HIV) infection.

Hematological diseases and treatments that significantly weaken the immune system, making individuals highly susceptible to respiratory tract infections (RTIs), such as COVID-19 and influenza, were identified as key conditions requiring monoclonal antibody (mAb) prophylaxis. These diseases and treatments are outlined in detail below (Table **2**). The inclusion of these conditions is driven by their immunosuppressive effects, which justify the need for additional protective measures, like mAbs prophylaxis.

Patients who have undergone allogeneic hematopoietic stem cell transplantation (HSCT) within the past 12 months, or those with active graft-*versus*-host disease (GVHD), regardless of the time since transplant, are considered highly immunocompromised. This also includes patients who have undergone HSCT for non-malignant diseases. Additionally, individuals with hematological malignancies who received total body irradiation or sustained chemotherapy cycles within the last 12 months are prioritized for prophylaxis due to their compromised immune response. Autologous HSCT recipients, patients with chronic myelomonocytic leukemia (CMML), and those with myelodysplastic syndrome (MDS) are also classified as being in immunocompromised states.

Table 1. Consensus statements regarding patient profiles for pre-exposure prophylaxis of monoclonal antibodies (mAbs) against COVID-19 infection based on priority patient profile.

Category	Consensus Statement	Agreement Level (%)
Haematological diseases	Hematological diseases/procedures make people most vulnerable to depletion of an immune response and are most likely to develop RTIs (COVID-19, influenza, others) and generally require monoclonal antibodies (mAbs) as prophylaxis.	90.5%
HIV/AIDS	Criteria for HIV at the highest risk for COVID-19 infection, requiring pre-exposure to monoclonal antibodies (mAbs) as prophylaxis.	100%
Immunomodulatory drugs (IMiDs)	Medications predispose to immune depletion mandating pre-exposure prophylaxis monoclonal antibodies (mAbs) against COVID-19 and other infectious diseases.	96%
Immunodeficiencies	Immunodeficiency conditions (primary) predispose to the highest risk of COVID-19 infection or other infectious diseases and require pre-exposure prophylaxis monoclonal antibodies (mAbs).	86.6%
Renal conditions	Advanced chronic renal disease requires pre-exposure prophylaxis monoclonal antibodies (mAbs) against COVID-19.	86%
Solid organ cancer	Solid organ cancers are most likely to develop RTIs (COVID-19, influenza, others) and require pre-exposure to monoclonal antibodies (mAbs) as prophylaxis.	80%
Liver conditions	Certain types of liver dysfunction require pre-exposure prophylaxis with monoclonal antibodies (mAbs) against COVID-19.	80%
Rare neurological and complex life-limiting neuro-disability conditions	Neurological autoimmune diseases on treatment put patients at increased risk for COVID-19 and other infections, and thus require pre-exposure to monoclonal antibodies (mAbs) as prophylaxis.	80%
Other categories	High-risk conditions pre-dispose patients to severely decreased immune response and require pre-exposure to monoclonal antibodies (mAbs) as prophylaxis against COVID-19.	83%
The efficacy of the use of monoclonal antibodies (mAbs) for COVID-19 (as per UAE requirements of use and the availability of the drug) The safety of the use of monoclonal antibodies (mAbs) for COVID-19 (as per UAE requirements of use and the availability of the drug)	When evaluating the efficacy of a preventive measure for COVID-19, focusing on ensuring safety, the key criteria or outcomes must be prioritized as clear indicators of efficacy, without notable safety concerns. Safe usage and increased risk of an inadequate response to COVID-19 vaccination and/or increased risk of exposure to SARS-CoV-2 OR for whom vaccination with any available COVID-19 vaccine, according to the approved or authorized schedule, is not recommended due to a history of severe adverse reaction to a COVID-19 vaccine(s) and/or COVID-19 vaccine component.	80% 80%

Table 2. Haematological diseases/procedures that make people vulnerable to depletion of an immune response (COVID-19, influenza, others) and require monoclonal antibodies (mAbs) for prophylaxis.

Haematological diseases	-
-	Allogeneic HSCT recipients in the last 12 months or active graft *versus* host disease (GVHD) regardless of time from transplant (including HSCT for non-malignant diseases)
-	Individuals with haematological malignancies who have received CAR-T cell therapy in the last 24 months, or radiotherapy in the last 12 months
-	Autologous HSCT recipients in the last 12 months (including HSCT for non-malignant diseases)
-	Chronic myelomonocytic leukaemia (CMML)
-	Myelodysplastic syndrome (MDS)
-	Chronic B-cell lymphoproliferative disorders (chronic lymphocytic leukaemia, follicular lymphoma)
-	AL amyloidosis
-	Myeloma [excluding monoclonal gammopathy of undetermined significance (MGUS)]
-	Individuals with haematological malignancies receiving systemic anti-cancer treatment (SACT) within the last 12 months
-	Myelofibrosis
-	All patients with sickle cell disease
-	Individuals with thalassemia or rare inherited anaemia with any of the following: • severe cardiac iron overload (T2 * less than 10ms on magnetic resonance imaging) • severe to moderate iron overload (T2 * greater than or equal to 10ms on magnetic resonance imaging) plus an additional co-morbidity of concern (for example, diabetes, chronic liver disease, or severe hepatic iron load on MRI)

Further, plasma cell dyscrasias, such as multiple myeloma and AL-amyloidosis (excluding smoldering multiple myeloma and MGUS), are included in this category, highlighting their weakened immune systems. The consensus also extends to individuals with transfusion-dependent thalassemia or rare inherited anemia with severe cardiac complications or moderate iron overload (*e.g*., diabetes, chronic liver disease, or severe hepatic iron load on MRI), all of whom have compromised immunity. Patients with myeloproliferative disorders undergoing chemotherapy, those with chronic B-cell lymphoproliferative disorders (*e.g*., chronic lymphocytic leukemia, follicular lymphoma), advanced sickle cell disease, and AL-amyloidosis are similarly considered for mAb prophylaxis due to their high susceptibility to infections.

The consensus also includes individuals with hematological malignancies undergoing systemic cancer treatments within the past 12 months. This is consistent with the findings of Otiniano *et al*. [36], Ocon *et al*. [31], and others, providing evidence that monoclonal antibodies could offer additional protection to patients with hematological malignancies. Although this protection may not be complete, it has the potential to reduce infection rates to levels comparable to those of vaccinated individuals in this population [32].

Furthermore, the National Comprehensive Cancer Network (NCCN) emphasizes that patients with blood cancers, as well as those receiving stem cell transplants or engineered cellular therapies (*e.g*., CAR T-cells), are less likely to mount adequate responses to COVID-19 vaccination and are at the highest risk of severe complications from the virus [37]. Therefore, the committee concludes that it is both reasonable and necessary to prioritize this population for pre-exposure prophylaxis with mAbs [31, 34, 36, 38, 39].

The panel agreed that patients with solid organ cancers who are most likely to develop LTRI (COVID-19, influenza, others) are required for a pre-exposure mAbs prophylaxis; these categories include patients with metastatic or locally advanced inoperable cancer, curable or uncurable solid organ cancers, patients receiving any chemotherapy (including antibody-drug conjugates), PI3K inhibitors or radiotherapy (total body) within 12 months, and patients who have had cancer resected within 3 to 12 months and receiving adjuvant chemotherapy or radiotherapy. According to published data, recipients with low anti-spike antibody responses to vaccination could benefit from the use of mAbs in pre-exposure prophylaxis. Stratified analysis by organ type showed a significantly lower incidence of SARS-CoV-2 infection in kidney and lung transplant recipients who received tixagevimab/cilgavimab compared to those who did not [40].

Regarding renal diseases, patients with chronic kidney disease (CKD) stage 4 or 5 (an eGFR less than 30ml per min per $1.73m^2$) without immunosuppression and/or major organ involvement, such as significant kidney, liver, or lung inflammation or significantly impaired renal, liver, and/or lung function, were included. Renal transplant recipients (including those with failed transplants within the past 12 months) and non-transplant renal patients who have received a comparable level of immunosuppression were also prioritized for mAbs prophylaxis. Studies by Khalil *et al*. and AS De Vriese *et al*. demonstrated the effectiveness of antiviral interventions with mAbs in patients with kidney diseases, and these were officially recommended by the Infectious Diseases Society of America (IDSA) and European Respiratory Society (ERS) [35, 41]. The next category was based on studies of patients with liver disease who are at increased risk of severe COVID-19 disease and death [42], and are overrepresented among those hospitalized for COVID-19, accounting for up to 20% of admitted patients. The reason for increased mortality in this specific category is suspected to be driven by a constellation of factors, including a heightened baseline inflammatory state and impaired immune function [43]. Therefore, the panel agreed to include a list of patients with liver disease. Those included

were patients who have undergone a liver transplant and patients with autoimmune liver disease on immune suppressive therapy. Individuals with liver disease on immune suppressive therapy and patients with cirrhosis Child-Pugh class A, B, and C, whether receiving immune suppressive therapy or not, and decompensated liver disease (Child-Pugh B and C), were also considered within the profile of patients requiring prophylaxis.

Patients with iatrogenic immunodeficiency states, especially those receiving anti-CD20 agents, mount a suboptimal humoral response to COVID-19 vaccination [44]. The study concluded that due to the absence of anti-SARS-Cov-2 antibodies after full vaccination, patients need to be identified who are at high risk and eligible for anti-COVID-19 monoclonal antibody prophylaxis [45]. These patients are thus candidates for additional strategies to protect them from COVID-19 [45]. The panel identified this category as patients who have received a B-cell depleting therapy (anti-CD20) within the last year, treated with high doses of mycophenolate, cyclophosphamide, cyclosporin, JAK inhibitors or tacrolimus, and those with a history of high dose steroid treatment (>1 mg/kg/day of prednisone or equivalent) or currently on high dose steroids. The panel also considered patients with uncontrolled/clinically active disease (*i.e.*, requiring recent increase in dose or initiation of new immunosuppressive drug or IM steroid injection or course of oral steroids within the 3 months prior to positive PCR).

Patients with common variable immunodeficiency (CVID) cannot generate their own antibodies against SARS-CoV-2, whether through vaccination or natural infection, and therefore constitute a particularly vulnerable and high-risk group. Vaccination and prevention of chronic COVID-19 in immunodeficient patients are therefore of paramount importance. Moreover, most patients with CVID exhibit suboptimal responses to vaccination, as outlined in the original European Society for Immunodeficiencies/Pan-American Group for Immunodeficiency 1999 and the more recent International Consensus Document 2016 diagnostic criteria for CVID. Therefore, the panel recommended including the following patients for prophylaxis intervention [46 - 48].

Patients with X-linked agammaglobulinaemia (and other primary agammaglobulinaemias), primary immunodeficiency associated with impaired type 1 interferon signaling and Wiskott–Aldrich Syndrome and GATA2 deficiency, were deemed as categories of patients suffering from immune deficiencies. Also included were patients with autoimmune polyglandular syndromes or autoimmune polyendocrinopathy, candidiasis, ectodermal dystrophy (APECED syndrome), severe combined immunodeficiency (SCID), Good's syndrome (thymoma plus B-cell deficiency), undefined primary antibody deficiency, or immunoglobulin (or eligible for Ig) and hyper-IgM syndromes.

Additionally, there was total agreement to include HIV/AIDS patients with elevated levels of immune suppression in the prophylaxis group, particularly those with uncontrolled or untreated HIV (high viral load) or those presenting acutely with an AIDS-defining diagnosis. However, these decisions were individualized following consultation with HIV specialists. Patients on treatment for HIV with a CD4 count of 200 cells/mm^3 or below, and those with additional risk factors, such as age, diabetes, obesity, cardiovascular disease, liver or renal disease, homelessness, or alcohol dependency, are also considered immunocompromised and eligible for mAbs prophylaxis. Furthermore, patients with rare autoimmune neurological conditions and severe complex life-limiting neurodisabilities, such as multiple sclerosis, Huntington's disease, and motor neuron diseases, were added to the profile of patients considered for mAbs prophylaxis. This inclusion was based on whether the patients are on treatments that compromise the immune system. As with HIV/AIDS patients, decisions for these groups were individualized in consultation with their treating neurologists to ensure the best clinical outcomes. Other high-risk conditions predisposing patients to decreased immune response were added to the profile of patients requiring pre-exposure monoclonal antibodies (mAbs) prophylaxis against COVID-19. The conditions and diseases, which were deemed to be potentially immunocompromised, included anti-CD38 monoclonal antibody or BMCA targeted therapy and treatment for chronic myeloid leukaemia (CML) in blast crises. Patients with lung conditions, such as refractory asthma, on high-dose steroids, moderate to severe interstitial or fibrotic lung disease (including idiopathic pulmonary fibrosis) on treatment, pulmonary embolism, bronchiectasis, and chronic obstructive pulmonary disease (COPD) on treatment, including emphysema, were included.

In addition to the above, heart conditions (refractory heart failure, cardiomyopathies on treatment), cystic fibrosis, and vaccine non-responders (based on lab testing for anti-spike antibody (LFAS) and lateral flow assay) were considered in the voting and confirmed by all the panel members to be potentially immunocompromised; however, this decision needs to be made after discussion with the treatment expert given the variability of immune responses with various treatments (Fig. **2**).

The final question was divided into two parts with the first part discussing past experiences with the use of monoclonal antibodies (mAbs), and whether it was safe to be used in patients with increased risk of exposure to COVID-19 as per certain criteria of increased risk for an inadequate response to COVID-19 vaccination and/or increased risk of exposure to SARS-CoV-2 or for whom vaccination with any available COVID-19 vaccine, according to the approved or authorized schedule, is not recommended due to a history of severe adverse reaction to a COVID-19 vaccine(s) and/or COVID-19 vaccine component.

The second part listed the main criteria for the expected outcomes of using monoclonal antibodies (mAbs) as a preventive measure, and included confirmation of no adverse effects in the patient and the risk reduction of infection with COVID-19.

4. IMMUNE EVASION AND VIRAL MUTATIONS

One significant challenge that could impact the efficacy of mAbs is the emergence of viral variants. SARS-CoV-2 has demonstrated a capacity for immune evasion through mutations, particularly in the spike protein, which is the

primary target for many neutralizing antibodies. Some variants, such as the Delta and Omicron variants, have shown partial resistance to certain mAbs, reducing their neutralizing capability [36]. This underscores the importance of ongoing surveillance and the development of next-generation mAbs that can target multiple epitopes or remain effective across a broader spectrum of viral mutations. Regular updates to prophylactic protocols, informed by emerging data on variant susceptibility, can be essential to maintaining the clinical relevance of mAbs in high-risk populations.

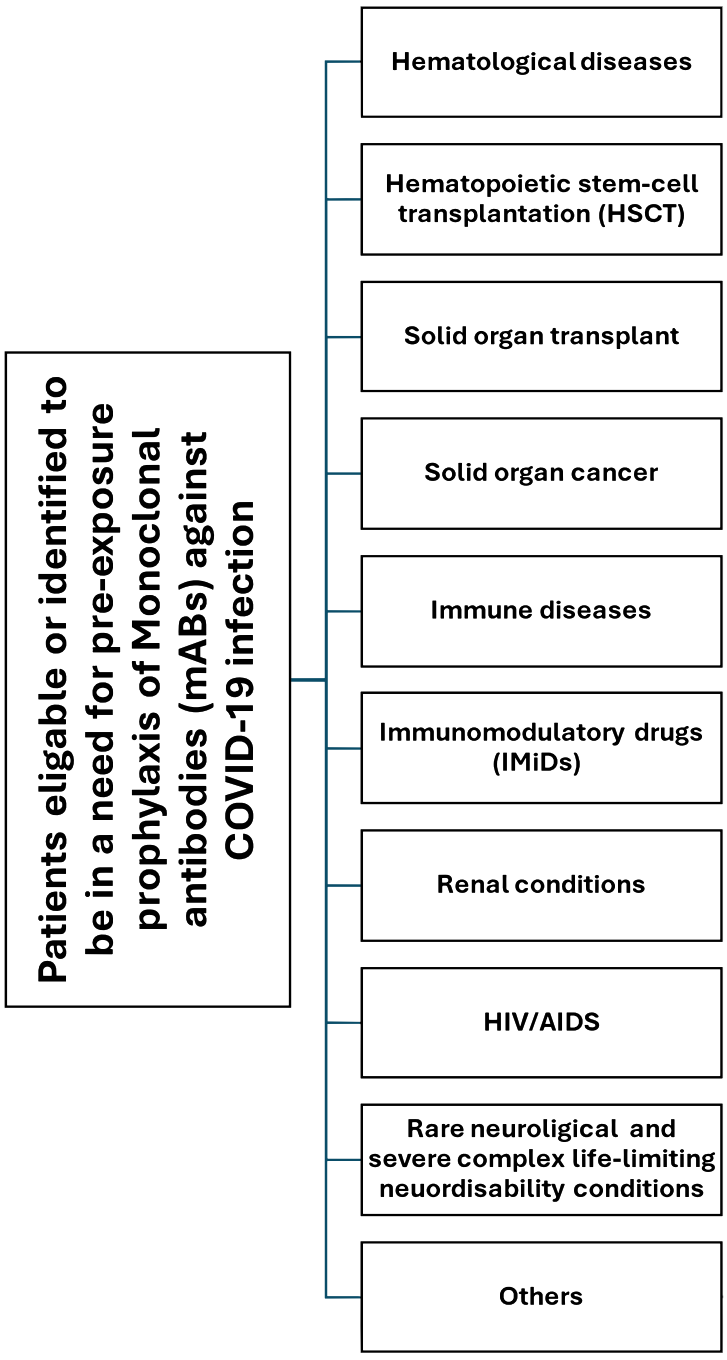

Fig. (2). Categories of patients eligible or identified to be in need of pre-exposure prophylaxis of monoclonal antibodies (mAbs) against COVID-19 infection.

5. RISKS AND SAFETY CONSIDERATIONS

While mAbs offer substantial protection for immunocompromised patients, it is crucial to consider the risks and potential contraindications associated with their use. Known side effects of mAbs include infusion-related reactions, hypersensitivity, and, in rare cases, anaphylaxis. Some patients may also experience adverse effects, such as fatigue, nausea, or headaches [38]. The risk of developing resistance to mAbs, particularly in cases where suboptimal doses are administered or in the setting of viral mutations, must also be considered. Therefore, clinicians must weigh the benefits of mAbs against these risks and carefully monitor patients for any adverse reactions during and after treatment. For certain populations, such as those with a history of severe allergic reactions, alternative prophylactic options or closer monitoring may be warranted.

6. PATIENT SELECTION AND TIMING

Optimizing patient selection for mAbs prophylaxis is critical to maximizing the benefits of this therapy. Not all immunocompromised patients respond equally to mAbs, and individual factors, such as the extent of immune suppression, timing of treatment, and the patient's history of infections, should be taken into account. For instance, patients who are more recently immunosuppressed or who have recently undergone hematopoietic stem cell transplantation (HSCT) may require more immediate prophylaxis compared to those with stable disease.

Timing of administration is another important factor. Administering mAbs before significant viral exposure or in the context of high community transmission could provide better protection than waiting until a patient is symptomatic or at risk. Additionally, ongoing monitoring of immune response and viral load in high-risk patients can inform adjustments to prophylactic regimens, ensuring sustained efficacy and safety. This is particularly relevant for patients receiving systemic cancer treatments, as their immune status may fluctuate over time.

7. LIMITATIONS AND FUTURE DIRECTIONS

7.1. Panel Size and Generalizability

While the panel size of nine specialized hematologists and infectious disease specialists from the UAE is appropriate for a Delphi study, the limited geographic scope may present challenges in generalizing the findings to other regions. The experts were independently nominated by the Emirates Society of Hematology, with established research profiles in hematology, ensuring that the consensus is highly relevant to the UAE healthcare context. However, this UAE-specific focus could limit the broader applicability of the recommendations to other healthcare systems or regions with different epidemiological and clinical challenges. To address this limitation, future iterations of the consensus should consider expanding the expert panel to include representatives from a wider range of countries and regions. This could enhance the generalizability of the consensus and improve its relevance across diverse healthcare systems, particularly in low-resource settings or regions with varying access to monoclonal antibody (mAb) treatments. Expanding the current consensus beyond the UAE and integrating data from long-term clinical studies can prove to be essential for improving the global applicability of mAbs prophylaxis. As the understanding of COVID-19 continues to evolve, ongoing research and collaboration among international experts can be critical in refining and updating prophylaxis strategies, ensuring that mAbs remain an effective tool in protecting immunocompromised populations worldwide.

8. LONG-TERM STUDIES AND REAL-WORLD EFFICACY

While the consensus recommendations are based on current evidence and expert opinion, there is a need for long-term clinical studies to assess the real-world efficacy of mAbs prophylaxis in reducing infection rates and improving outcomes among at-risk populations. Future research should focus on evaluating how mAbs perform in diverse patient groups, especially those who exhibit suboptimal vaccine responses, such as individuals with hematological malignancies, HIV/AIDS, and severe renal or autoimmune conditions. These studies should track not only the efficacy of mAbs in preventing COVID-19 infection, but also their impact on reducing severe outcomes, hospitalization rates, and long-term complications in high-risk patients.

Given the ongoing emergence of SARS-CoV-2 variants, it is also important to monitor the long-term effectiveness of mAbs in neutralizing different viral strains. Future studies should explore the durability of protection provided by mAbs and the potential need for booster doses, especially as viral mutations continue to pose a challenge to both vaccination and mAb therapies.

CONCLUSION

Monoclonal antibodies (mAbs) have emerged as an essential tool for COVID-19 prophylaxis, particularly for individuals with hematological malignancies and other immunocompromised conditions who are at high risk of severe disease. While vaccination remains the primary defense against COVID-19, many patients in these high-risk groups exhibit suboptimal immune responses to vaccines, leaving them vulnerable to infection despite vaccination. This underlines the critical role that mAbs can play in providing additional protection, especially as an adjunct to vaccination.

Evidence from recent studies highlights that mAbs can offer significant protection in both vaccinated and unvaccinated populations, although their impact is particularly beneficial for those with weakened vaccine-induced immunity. In patients who fail to mount an adequate response to vaccination, mAbs serve as a vital prophylactic measure to reduce the risk of symptomatic infection and severe outcomes.

However, more data comparing the effectiveness of mAbs in vaccinated *versus* unvaccinated patients can help refine patient selection and optimize their use. This is especially important for ensuring that mAbs are deployed effectively in individuals with varying levels of vaccine-induced immunity. As new variants of SARS-CoV-2 emerge, it is essential to

monitor the continued efficacy of mAbs, particularly in populations that rely on them as their primary form of protection.

In summary, mAbs complement vaccination efforts, particularly for immunocompromised patients, by filling the gap left by suboptimal vaccine responses. Moving forward, integrating data from both vaccinated and unvaccinated populations can prove to be key to guiding clinical decision-making and ensuring that the most vulnerable patients receive the most appropriate and effective COVID-19 prevention strategies.

AUTHORS' CONTRIBUTION

S.H., J.A., A.R.A., M.A., A.Al.M., B.G., A.L., H.Y.O., P.K.: All contributed to the delphie and discussion meetings; S.H., A.Al.M., A.R.A. and M.A.: Contributed to writing the main manuscript; S.H., B.G., A.L., H.Y.O., P.K.: Contributed to revising the main manuscript.

LIST OF ABBREVIATIONS

MDS = Myelodysplastic syndrome
MPN = Myeloproliferative neoplasm
HL = Hodgkin lymphoma
NHL = Non-Hodgkin lymphoma
DLBCL = Diffuse large B-cell lymphoma
MCL = Mantle cell lymphoma
FL = Follicular lymphoma
MM = Multiple myeloma
SLL = Small lymphocytic lymphoma
CLL = Chronic lymphocytic leukemia
GBD = Global Burden of Disease Study
ASR = Age-standardized rates
DALYs = Disability-adjusted life years
MOHAP = Ministry of Health and Prevention
ORR = Overall response rates
mAb = Monoclonal antibody
DHSC = Department of Health and Social Care
CAR = Chimeric antigen receptor
HSCT = Hematopoietic stem cell transplant
RTIs = Respiratory tract infections
HSCT = Hematopoietic stem cell transplantation
GVHD = Graft*versus*host disease
CMML = Chronic myelomonocytic leukemia
CVID = Common variable immunodeficiency
SCID = Severe combined immunodeficiency
LFAS = Lateral flow assay
COPD = Chronic obstructive pulmonary disease

CONSENT FOR PUBLICATION

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CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

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APPENDIX

Appendix A. Medical conditions and categories of patient profiles for each condition included in voting for consensus.

Main Category	Subcategory
Solid organ cancer	Q) Which solid organ cancers are most likely to develop RTIs (COVID-19, influenza, others) and benefit from pre-exposure monoclonal antibodies (mAbs) as prophylaxis?
-	Metastatic or locally advanced inoperable cancer
	Lung cancer (at any stage)
	Patients receiving any chemotherapy (including antibody-drug conjugates), PI3K inhibitors, or radiotherapy within 12 months.
	Patients who have had cancer resected within 3 months and who have received no adjuvant chemotherapy or radiotherapy.
	Patients who have had cancer resected within 3 to 12 months and have received no adjuvant chemotherapy or radiotherapy.
Haematological diseases	Q) Which haematological diseases/procedures make people most vulnerable to depletion of an immune response and are most likely to develop RTIs (COVID-19, influenza, others) and may benefit from monoclonal antibodies (mAbs) as prophylaxis?
-	Allogeneic HSCT recipients in the last 12 months or active graft *versus* host disease (GVHD) regardless of time from transplant (including HSCT for non-malignant diseases).

Main Category	Subcategory
-	Individuals with haematological malignancies who have received CAR-T cell therapy in the last 24 months, or radiotherapy in the last 12 months.
	Autologous HSCT recipients in the last 12 months (including HSCT for non-malignant diseases).
	Chronic myelomonocytic leukaemia (CMML)
	Myelodysplastic syndrome (MDS)
	Chronic B-cell lymphoproliferative disorders (chronic lymphocytic leukaemia, follicular lymphoma)
	AL amyloidosis
	Myeloma [excluding monoclonal gammopathy of undetermined significance (MGUS)]
	Individuals with haematological malignancies receiving systemic cancer treatments within the last 12 months.
	Myelofibrosis
	All patients with homozygous sickle cell disease.
	Individuals with thalassemia or rare inherited anaemia with any of the following: • severe cardiac iron overload (T2 * less than 10ms on magnetic resonance imaging) • severe to moderate iron overload (T2 * greater than or equal to 10ms on magnetic resonance imaging) plus an additional co-morbidity of concern (for example, diabetes, chronic liver disease, or severe hepatic iron load on MRI)
Renal conditions	Q) What renal disease conditions benefit from pre-exposure prophylaxis monoclonal antibodies (mAbs) against COVID-19? Who are the most at risk?
-	Renal transplant recipients (including those with failed transplants within the past 12 months), particularly those who have: • received B cell depleting therapy within the past 12 months [including alemtuzumab, rituximab (anti-CD20), anti-thymocyte globulin] • an additional substantial risk factor that would in isolation make them eligible for monoclonals or oral antivirals • not been vaccinated prior to transplantation
	Non-transplant renal patients who have received a comparable level of immunosuppression (highest-risk adult patients for assessment for neutralising monoclonal antibodies).
	Patients with chronic kidney disease (CKD) stage 4 or 5 (an eGFR less than 30ml per min per 1.73m^2) without immunosuppression and/or major organ involvement, such as significant kidney, liver, or lung inflammation, or significantly impaired renal, liver, and/or lung function (highest risk clinical subgroups upon community infection with SARS-CoV-2).
Liver conditions	Q) What types of liver dysfunction benefit from pre-exposure prophylaxis monoclonal antibodies (mAbs) against COVID-19?
-	Patients with cirrhosis Child-Pugh class A, B, and C, whether receiving immune suppressive therapy or not.
	Decompensated liver disease (Child-Pugh B and C)
	Individuals with a liver transplant
	Individuals with liver disease on immune suppressive therapy
	Liver transplant and autoimmune liver disease in immune suppressive therapy recipients
Immune-mediated inflammatory diseases (IMIDs)	Q) What medications predispose to immune depletion benefiting from pre-exposure prophylaxis monoclonal antibodies (mAbs) against COVID-19 and other infectious disease?
-	Patients who have received a B cell-depleting therapy (anti-CD20) within the last year.
	Patients who are on or have received steroids within 28 days (10mg daily prednisolone equivalent or more, including budesonide). * Definition for steroid dose, equivalent to > 10 mg/day of prednisolone for at least 28 days prior to positive PCR.
	Patients who are on or have received 20mg steroids for at least 14 days.
	Patients who have tapered the dose or stopped the dose of steroids within the last 12 months.
	Patients treated with mycophenolate, cyclophosphamide, cyclosporin, JAK inhibitors, or tacrolimus.
	Patients with uncontrolled or unstable clinically active disease and/or flaring disease.
-	* IMID patients on whom the following criteria also apply: uncontrolled/clinically active disease (*i.e.*, required recent increase in dose or initiation of new immunosuppressive drug or IM steroid injection or course of oral steroids within the 3 months prior to positive PCR)
Immune deficiencies	Q) What immune conditions (primary or secondary) predispose to the highest risk of COVID-19 infection or other infectious diseases and may benefit from pre-exposure prophylaxis monoclonal antibodies (mAbs)?

Main Category	Subcategory
-	Common variable immunodeficiency (CVID)
	Any person with secondary immunodeficiency receiving, or eligible for, immunoglobulin replacement therapy.
	X-linked agammaglobulinaemia (and other primary agammaglobulinaemias)
	Primary immunodeficiency associated with impaired type 1 interferon signaling
	Autoimmune polyglandular syndromes or autoimmune polyendocrinopathy, candidiasis, ectodermal dystrophy (APECED syndrome)
	Severe combined immunodeficiency (SCID)
	Good's syndrome (thymoma plus B-cell deficiency)
	Undefined primary antibody deficiency on immunoglobulin (or eligible for Ig), highest-risk patients eligible for new COVID-19 treatments (GOV.UK)
	Hyper-IgM syndromes
HIV/AIDS	Q) Do the below criteria apply to patients with HIV at the highest risk of COVID-19 infection and can they benefit from pre-exposure monoclonal antibodies (mAbs) as prophylaxis?
-	Patients with high levels of immune suppression, having uncontrolled or untreated HIV (high viral load), or presenting acutely with an AIDS-defining diagnosis.
	Patients on treatment for HIV with CD4 less than 350 cells per mm^3 and stable on HIV treatment or CD4 greater than 350 cells per mm^3 and additional risk factors (for example, age, diabetes, obesity, cardiovascular, liver or renal disease, homelessness, alcoholic dependency).
Rare neurological and severe complex life-limiting neurodisability conditions	Q) Would the following neurological diseases put patients at increased risk for COVID-19 and other infections and do they require pre-exposure monoclonal antibodies (mAbs) as prophylaxis?
-	Multiple sclerosis
	Huntington's disease
	Motor neuron disease
	Myasthenia gravis
Others	Q) What other high-risk conditions predispose patients to decreased immune response and can they benefit from pre-exposure monoclonal antibodies (mAbs) as prophylaxis against COVID-19?
-	Individuals with chronic myeloid leukemia (CML) or those who are receiving first or second-line tyrosine-kinase inhibitor (TKI) therapy.
	Chemotherapy recipients within 12 months
	Anti-CD38 monoclonal antibody or BMCA targeted therapy
-	High-risk pregnancies
-	Geriatric individuals (above 75 years of age)
-	Obesity (body mass index > 30)
-	Adult diabetes type 1
-	Disabilities (Down syndrome, cerebral palsy, ADHD, birth defects, intellectual and developmental disabilities)
-	Chronic lung diseases, *e.g.*, asthma, moderate to severe (requiring treatment)
	Interstitial lung disease (including idiopathic pulmonary fibrosis) requiring treatment
	Symptomatic pulmonary embolism within 3 months of the episode
	Bronchiectasis requiring treatment
	Chronic obstructive pulmonary disease (COPD), including emphysema and chronic bronchitis (requiring treatment)
	Primary pulmonary hypertension (requiring treatment)
-	Chronic heart conditions requiring treatments (heart failure, coronary artery disease, cardiomyopathies)
-	Cystic fibrosis on treatment
-	Dementia or other neurological conditions that lead to considerable disability
-	Confirmed vaccine non-responders [based on lab testing for antispike antibody (LFAS) and lateral flow assay]
Efficacy and safety of the use of monoclonal antibodies (mAbs) for COVID-19 (as per UAE requirements of use and availability of the drug (tixagevimab/cilgavemab)	-

Main Category	Subcategory
Early intramuscular administration of SARS-CoV-2 monoclonal antibodies (mAbs) as preexposure prophylaxis [38, 48]	A) Medical conditions or treatments that may result in moderate to severe immune compromise and an inadequate immune response to COVID-19 vaccination include, but are not limited to: Active treatment for solid tumor and hematologic malignancies • Hematologic malignancies associated with poor responses to COVID-19 vaccines regardless of current treatment status (*e.g.*, chronic lymphocytic leukemia, non-Hodgkin lymphoma, multiple myeloma, acute leukemia). • Receipt of solid-organ transplant or an islet transplant and taking immunosuppressive therapy. • Receipt of chimeric antigen receptor (CAR)-T-cell or hematopoietic stem cell transplant (within 2 years of transplantation or taking immunosuppression therapy). • Moderate or severe primary immunodeficiency (*e.g.*, common variable immunodeficiency disease, severe combined immunodeficiency, DiGeorge syndrome, Wiskott-Aldrich syndrome) (people who are immunocompromised | CDC). • Advanced or untreated HIV infection (people with HIV and CD4 cell count <200/mm3, history of an AIDS-defining illness without immune reconstitution, or clinical manifestations of symptomatic HIV). • Active treatment with high-dose corticosteroids (*i.e.*, ≥20 mg prednisone or equivalent per day when administered for ≥2 weeks), alkylating agents, antimetabolites, transplant-related immunosuppressive drugs, cancer chemotherapeutic agents classified as severely immunosuppressive, and biologic agents that are immunosuppressive or immunomodulatory (*e.g.*, B-cell depleting agents). B) **OR** for whom vaccination with any available COVID-19 vaccine, according to the approved or authorized schedule, is not recommended due to a history of severe adverse reaction to a COVID-19 vaccine(s) and/or COVID-19 vaccine component(s).

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