Special Issue

December 2024

التقدم العلمي

Dr. Abdulmohsen Ebrahim Alterki

A Scientist Revolutionizing A Silent Epidemic

Exploring Cutting-Edge Diagnosis and Prognosis for Obstructive Sleep Apnea (OSA)

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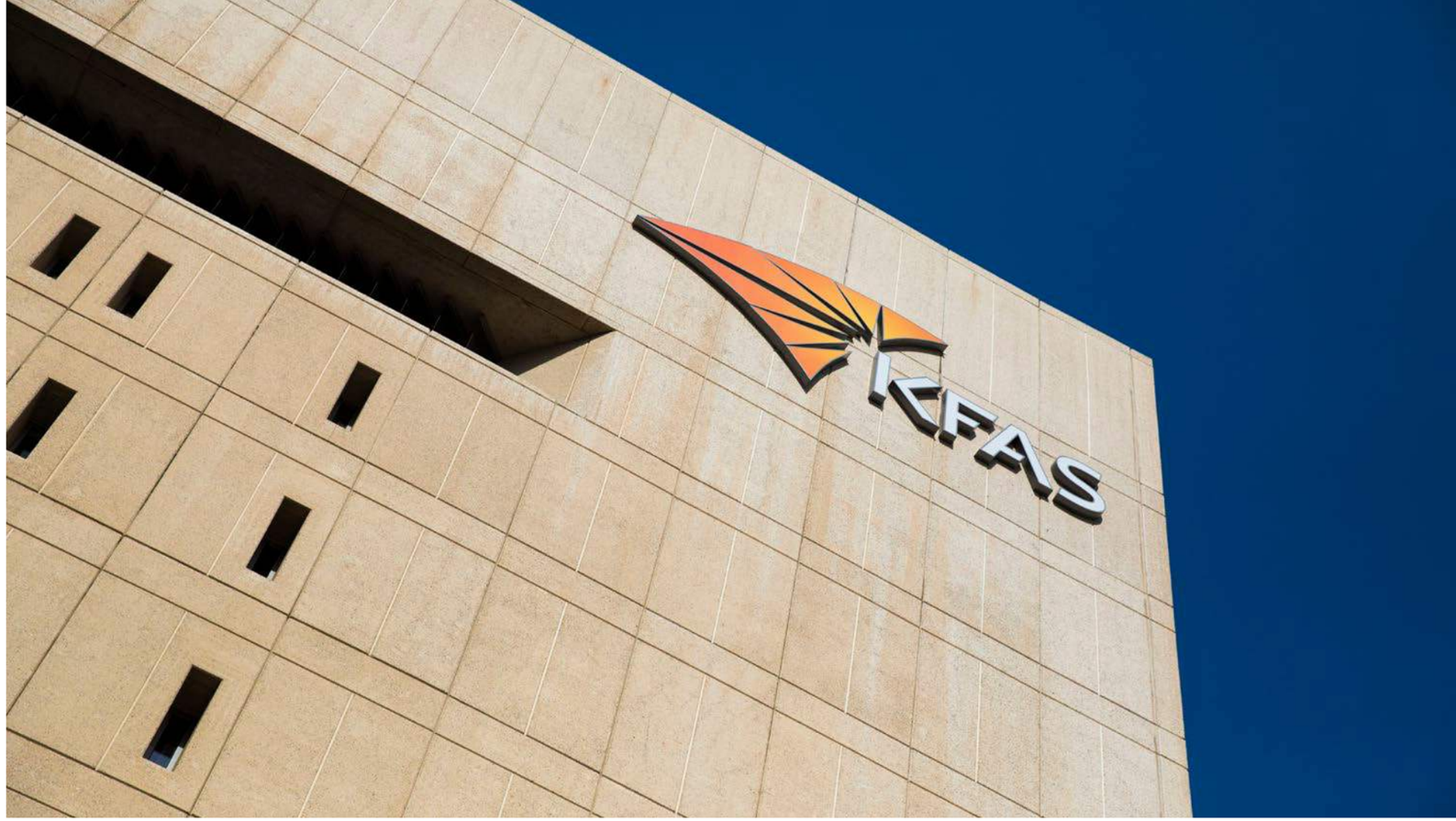

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Kuwait Foundation for the Advancement of Sciences

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التقدم العلمي
AL-TAQADDUM AL-ILMI

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Inspiring Tomorrow's Leaders: Celebrating Kuwaiti Success Stories in Science and Innovation

In this special issue of Al-Taqaddum Al-Ilmi, the Kuwait Foundation for the Advancement of Sciences (KFAS) proudly highlights a groundbreaking research initiative led by Dr. Abdulmohsen Ebrahim Alterki and his team. They are pioneering new approaches to diagnosing and understanding Obstructive Sleep Apnea (OSA), a significant yet underdiagnosed health issue that impacts millions worldwide and can lead to severe health consequences, from cardiovascular risks to metabolic disorders. Current diagnostic methods are often invasive and challenging, discouraging many from seeking necessary treatment. Dr. Alterki and his team seek to address these challenges, aiming to develop non-invasive diagnostic methods using blood biomarkers. This approach could revolutionize how OSA is diagnosed, enhancing accessibility and allowing earlier intervention, which is essential for improving patient outcomes.

Supported by KFAS and carried out in partnership with the Dasman Diabetes Institute (DDI), a subsidiary of KFAS, along with international collaborators in Amsterdam, Dr. Alterki's research exemplifies the power of global cooperation in addressing Kuwait's healthcare priorities. Through this project, KFAS highlights the importance of international collaboration in advancing scientific research that tackles national and global health challenges. Such partnerships enrich Kuwait's research landscape by infusing it with diverse expertise, perspectives, and innovative solutions, helping to position Kuwait as a valuable contributor to the global scientific community.

Dr. Alterki's journey reflects KFAS's mission to inspire future generations of Kuwaiti scientists by fostering curiosity and encouraging collaboration. As you explore this issue, we hope you find inspiration in the innovative spirit and dedication that are advancing Kuwait's scientific community forward.

Together, we are shaping a future where science serves humanity, both locally and globally.

Ameenah Farhan
Director General

Exploring Cutting-Edge Diagnosis and Prognosis for Obstructive Sleep Apnea (OSA)

A Groundbreaking Study at Dasman Diabetes Institute Bridging Sleep Apnea and Type 2 Diabetes

OSA is becoming a significant health problem, and its proper diagnosis requires the use of an expensive and lengthy procedure known as overnight sleep study; Biomarkers are showing great promise in advancing our understanding of OSA, as well it has the potential of being a rapid & a cheaper alternative to sleep study

Stav Dimitropoulos

Profile

Dr. Abdulmohsen Alterki

Position:
Doctor at the Ministry of Health since 1994, and Dasman Diabetes Institute (DDI) since 2013.

Specialization:
Consultant in ENT (Ear, Nose, and Throat) and Head and Neck Surgery.

Qualifications:
Canadian Board and Fellowship.

Affiliations:
Zain Hospital and Al-Sabah Hospital, Ministry of Health, Kuwait.

Research Role:
Research Associate at DDI.

Research Focus:
Projects on obstructive sleep apnea.

Introduction

Dr. Abdulmohsen Ebrahim Alterki is on a mission to change the game in diagnosing and treating Obstructive Sleep Apnea (OSA), a widespread but underdiagnosed condition that affects millions and raises severe health risks, from persistent fatigue to heart problems. Current diagnostics for OSA often involve uncomfortable, overnight sleep lab tests, where patients must sleep with various sensors attached, making natural sleep elusive. This complex setup deters many from seeking the help they need, leading to a silent wave of undetected cases and untreated health risks.

Dr. Al Terki's research, backed by the Kuwait Foundation for the Advancement of Sciences (KFAS) and his team at the Dasman Diabetes Institute (DDI), in collaboration with Dutch hospital OLVG, explores innovative, non-invasive methods to simplify OSA diagnosis. His work targets the identification of biomarkers—specific molecular signatures in blood or saliva—that could make OSA screening as simple as routine testing. By reducing the need for in-lab sleep studies, these advancements could improve early diagnosis access and prioritize treatment for high-risk patients.

Dr. Al Terki's efforts reflect a collaborative, global drive to develop solutions that enhance life quality and ease healthcare burdens. His groundbreaking research could mark a turning point for individuals suffering from OSA and other related conditions, like Type 2 diabetes, which are especially prevalent in Kuwait. By redefining how we detect and manage OSA, Dr. Al Terki is paving the way for accessible, patient-centered care, addressing the urgent need to prevent the hidden risks of untreated sleep apnea.

Published Articles

DDI / OLVG Collaboration

1. Leentjens M, Bosschieter PFN, AI-Terki A, de Raaff CAL, de Vries CEE, Hammad M, Thanaraj TA, AI-Khairi I, Cherian P, Channanath A, Abu-Farha M, de Vries N, Abubaker J. The association between biomarker angiopoietin-like protein five and obstructive sleep apnea in patients undergoing bariatric surgery. Sleep Breath. 2022 Nov 30. doi: 10.1007/s11325-022-02736-6. Epub ahead of print. PMID: 36449218.

2. Leentjens M, Alterki A, Abu-Farha M, Bosschieter PFN, de Raaff C, de Vries C, Al Shawaf E, Thanaraj TA, AI-Khairi I, Cherian P, Channanath A, Kavalakatt S, van Wagensveld BA, de Vries N, Abubaker J. Increased plasma ANGPTL7 levels with increased obstructive sleep apnea severity. Front Endocrinol (Lausanne). 2022 Aug 9;13:922425. doi: 10.3389/fendo.2022.922425. PMID: 36017324; PMCID: PMC9396619.

3. Leentjens M, Alterki A, Abu-Farha M, Bosschieter PFN, de Raaff C, de Vries C, Al Shawaf E, Thanaraj TA, AI-Khairi I, Cherian P, Channanath A, Kavalakatt S, van Wagensveld BA, de Vries N, Abubaker J. Increased plasma IGFBP2 levels with increased obstructive sleep apnea severity. In preparation

About the Research

Research Focus: This study investigates advanced treatments for obstructive sleep apnea (OSA), aiming to improve both diagnosis and outcomes, especially for individuals affected by obesity.

Big Picture: OSA is a widespread condition impacting millions, and finding effective, accessible treatments can greatly improve quality of life and reduce health risks linked to heart disease and metabolic issues.

Why It Matters: OSA not only disrupts sleep but also increases the risk of severe health problems. Improving treatment options could help many people lead healthier lives.

Methodology: The research examines biomarkers in the blood that might replace traditional, costly sleep studies as a simpler way to diagnose and monitor OSA.

Key Discovery: Early findings suggest that certain biomarkers could reveal the presence and severity of OSA, potentially offering a new, less invasive approach to treatment follow-up.

Real-World Applications: This work could streamline OSA diagnosis and make treatments more accessible, reducing dependence on costly and bothersome studies.

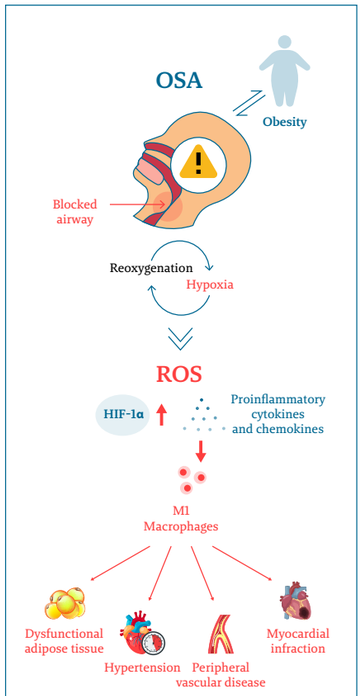
Future Potential: This research opens doors to new diagnostic tools and personalized treatments, which could be adapted for global use, especially in regions with limited access to advanced medical technology.

Collaboration: The project brings together experts from Kuwait's Dasman Diabetes Institute (DDI) and Amsterdam's OLVG Hospital, combining regional knowledge with international expertise.

Sustainable Impact: By focusing on a non-invasive, biomarker-based approach, the study supports sustainable healthcare by potentially reducing resource-heavy testing methods.

With colleagues from ENT surgeons, anesthesiologists, nursing staff, and technicians at Zain Hospital, Al-Sabah Medical Area.

مع بعض الزملاء الأطباء جراحي الأنف والأذن والحنجرة، وأطباء التخدير، والهيئة التمريضية والفنيين بغرفة العمليات في مستشفى زين بمنطقة الصباح الطبية.



Obesity and OSA: a bidirectional interaction. The repetitive cycles of hypoxia-reoxygenation due to frequent blockage of the upper airway in people with OSA triggers the activation of various pathological mechanisms and induces a rise in HIF-. The chronic presence of this condition has deleterious consequences on the cardiovascular system.

Int. J. Mol. Sci. **2023**, 24(7), 6807; https://doi.org/10.3390/ijms24076807

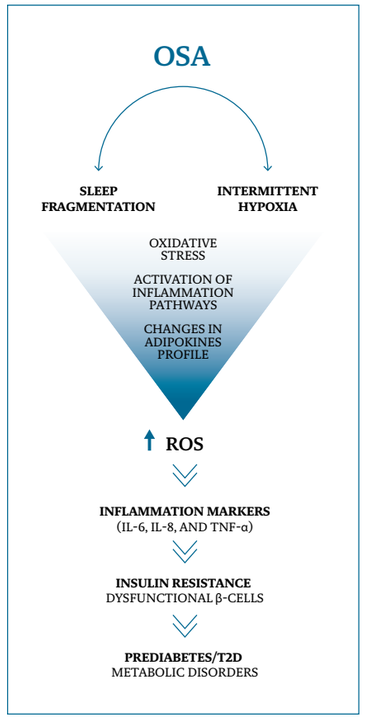
Sleep apnea isn't just about loud snoring; it's a major health risk that deserves the same urgency and attention as chronic diseases

A staggering one billion adults worldwide are estimated to have mild to severe obstructive sleep apnea (OSA), one of the most serious forms of sleep apnea. OSA occurs when the upper airway becomes blocked during sleep, causing breathing interruptions, loud snoring, daytime sleepiness, morning headaches, dry mouth, and more. Among individuals with OSA, almost 80% may be unaware of their condition.

"I've had patients with severe sleep apnea—let's say, for example, a patient undergoing bariatric surgery. The patient is already obese and has severe sleep apnea, but it has gone undetected. You put them under anesthesia, and when they wake up, they're groggy, on pain medications, and their sleep apnea complicates things. You can't just put them back in the ward; some of the patients might develop episodes of apnea overnight if not monitored, because the majority might have undiagnosed OSA," says Dr. Abdulmohsen Ebrahim Alterki, consultant in Otolaryngology, Head and Neck surgery, and research associate at Dasman Diabetes Institute (DDI). The process strains the healthcare system and increases the risk of complications for the patient. That is why you need proper and accurate sleep apnea diagnosis, and for this, novel methods are needed.

In an ongoing project funded by the Kuwait Foundation for the Advancement of Sciences (KFAS), Dr. Alterki and his team are investigating advanced treatments for OSA and their impact on Type 2 diabetes (T2D) and obesity. Conducted at DDI, one of KFAS's subsidiaries, the study hypothesizes that treating OSA can improve glycemic control and insulin sensitivity, helping in management or even prevention of T2D. The research also aims to identify specific novel blood biomarkers related to OSA, offering a simpler, less expensive, and more accessible diagnostic method than traditional sleep studies, which are often costly, time-consuming, and require overnight monitoring in specialized labs.

The study compares various OSA treatments—such as surgery, oral appliances, or continuous positive airway pressure (CPAP), a popular method involving a machine delivering air pressure through a mask to keep the airway open during sleep, which Dr. Alterki imaginatively describes as "a vacuum cleaner in reverse". It also compares their effects on blood and adipose tissue markers, indicators in body fat that help doctors understand how conditions like sleep apnea and obesity affect the body's metabolism and response to treatments. The goal is to validate these biomarkers against traditional polysomnography (PSG), which is the current gold standard method for diagnosing OSA. By linking biochemical, genetic, and epigenetic markers to OSA severity and glycemic control, Dr. Alterki and his colleagues hope they could potentially transform OSA treatment and reduce risks for pre-diabetic patients and those with cardiovascular issues.



Potential mechanism linking hypoxia to T2D.

Int. J. Mol. Sci. **2023**, 24(7), 6807; https://doi.org/10.3390/ijms24076807

Sleep apnea is a silent disruptor—undetected, it can slowly erode a person's health, leaving them prone to depression, accidents, and diminished job performance without ever realizing why

"Medicine was always my calling," Dr. Alterki says. However, when it comes to sleep apnea, there are two personal issues he rarely talks about. "I had two elder brothers who died in early childhood from something called sudden infant death syndrome (SIDS)," he says, a condition some believe could be caused by OSA. Dr. Alterki's father, who passed away from a heart attack in 1999, also had undiagnosed OSA. "When we used to take siestas in the afternoon, my father's snoring was like music to my ears," Dr. Alterki reflects. But in reality, that was not a sign of peaceful sleep but a disorder. "If I had known more about this condition back then, I might have been able to save his life with proper diagnosis and medical treatment."

After completing his secondary education at Kaifan High School in Kuwait, Dr. Alterki earned his Bachelor of Medicine and Surgery from the Royal College of Surgeons in Ireland in 1999. He later moved to Canada, where he spent six years, completing advanced medical training and earning the Canadian Board Certification and a Fellowship in Otolaryngology, Head and Neck Surgery.

In 2003, Dr. Alterki returned to Kuwait, where he began practicing and focusing on patients with OSA.

In 2010, he began collaborating with Sabah Al-Ahmad Center for Giftedness and Creativity, a subsidiary of KFAS. This partnership helped propel his work on sleep apnea and related disorders, leading to his first patent in 2013, from the United States Patent and Trademark Office (USPTO), followed by multiple other patents. His latest patent was awarded in 2022, titled: Internal Nasal Splint to improve breathing after nasal surgery.

The work of Dr. Alterki was not limited to patients with OSA in Kuwait; he established several international relations through DDI. For example, this partnership paved the way for collaborations with a Dutch group in Amsterdam, where several joint studies were conducted on patients suffering from obesity and sleep apnea. Numerous scientific papers were published in leading journals in this field.

A common misconception people have is that obesity and sleep apnea always go hand in hand. Although obesity is a risk factor—especially in countries like Kuwait, where there is a high prevalence of obesity—Dr. Alterki considers it a myth to assume only obese individuals are at risk. "I see lots of moms coming to me saying, 'Doc, my child eating healthy, exercising, not eating junk food, why can't he sleep well?' I have young, fit, non-obese women—CrossFit athletes—telling me, 'Doc, I snore like crazy, I eat healthy, I exercise, but it's not working...'" After undergoing sleep studies, these people are often shocked to discover they have severe sleep apnea. And because they are diagnosed, they are considered lucky.

Unlike cancer, which develops quickly, sleep apnea takes a slower trajectory, gradually deteriorating a person's health in the background. If undiagnosed, it can leave the individual depressed and disoriented, prone to

From left to right, DDI Team:
مـن اليسـار إلى اليـمين، فريق معهد دسـمان للسـكري:

Dr. Eman Alshawaf, Scientist
الدكتورة إيمان الشواف، باحث علمي

Dr. Mohamed Abu-Farha, Principal Scientist
الدكتور محمد أبو فرحة، كبير باحثين علميين/ رئيس قسم

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الدكتور فيصل الرفاعي، المدير العام بالوكالة

Dr. Abdulmohsen Alterki
الدكتور عبد المحسن التركي

Dr. Jehad Abubaker, Principal Scientist
الدكتور جهاد أبو بكر، كبير باحثين علميين / رئيس قسم

car accidents and injuries at work, with reduced job performance.

Dr. Alterki cannot stress enough the importance of novel biomarkers and the need for precision medicine (or tailored treatment to an individual's unique genetic and personal factors) in the fight against the silent disruptor that is obstructive sleep apnea. When the novel biomarkers he and his team are working on—thanks in large part to the support of KFAS—are finally released, the team will potentially revolutionize how the medical establishment diagnoses and treats this disorder. It may even lead to a world-first development, integrating the biomarkers as a simple routine testing.

"If the biomarker levels are high, we'll know which patients need to be prioritized for treatment. We will reduce pressure on the sleep labs and catch errors that might otherwise go unnoticed," Dr. Alterki says. In the long run, countless individuals suffering in silence could finally have the chance for better sleep and an improved quality of life.