IN CONVERSATION

“Women rarely put themselves forward despite being very capable.”

Professor Gagandeep Kang is currently the Executive Director of Translational Health Science and Technology Institute (THSTI), Faridabad. She is the first Indian woman scientist to be elected as Fellow of Royal Society (FRS) by the Royal Society in the UK. She is a leading scientist with over 300 scientific research papers published on diarrhoeal infections in children, mainly from work done at the Christian Medical College (CMC) in Vellore. Amongst several awards, she is the recipient of the Infosys Life Sciences Award in 2016. She is a member of many review and advisory committees for national and international funding agencies related to public health. Dr. Kang has chaired the WHO SEAR’s Regional Immunization Technical Advisory Group since 2015.

In an interview given to PARUL R. SHETH for Science Reporter, Dr Gagandeep Kang talks about her work on rotaviruses, safety of Indian vaccines, the advantages and disadvantages of being a woman in science, and her experiences with community health programmes.
PARUL R. SHETH: Congratulations to you for being the first woman scientist to be elected as FRS in 360 years! This indeed is a great honour and we are all proud of you. Your work has been recognised for its quality and impact. How do you feel? Being a woman, did you face any hindrances to pursue your goal?

GAGANDEEP KANG: Recognition of my contributions to science is actually recognition of my team and the work that we have done over the past two decades mainly at the Christian Medical College (CMC), Vellore, and with partners and collaborators in institutions across the length and breadth of India. It feels really good that the Royal Society values our contributions to public health research in India.

Being a woman is an advantage in many ways in science; we multi-task better, get things done quicker, we need to – because we have to handle so many different responsibilities in our various roles. I learned how to get things done from my mother who worked her entire professional life, taking everything she needed to do in her stride.

Being a woman is also a disadvantage in a hierarchical structure, where the value of women’s professional and societal contributions is not recognised. Thinking about it, had I not had the many delays and complications that came because of the gender, the same research might have been done 5-6 years earlier, which is significant in a 30-year career.

PRS: What made you choose community-related health issues after completing your MBBS? Was there someone or something that inspired you to take on this relevant work very much related to the present Indian health scenario?

GAGANDEEP KANG: I believe in fairness in all things – your position in society should not determine what you get or you don’t get. I work on diarrhoeal disease in children, which is a neglected area of research. When doctors decide to do more research, they quite often go into more glamorous fields such as neuroscience, cancer, HIV, etc. Diarrhoea and pneumonia are silent killers of poor children; the rich do not die of these conditions. I thought this is one area that matters so much more than society and most of the medical community realises, and there is an opportunity to promote equity, by ensuring that interventions that we work on, vaccines, safe water, sanitation and nutrition reach the people who need them the most.

PRS: Your area of research includes enteric (intestinal) infections in children. How common are viral and parasitic enteric infections in India?

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GAGANDEEP KANG: My colleague, Ira and I published a paper a couple of years ago, comparing children of doctors and children who lived in urban slum areas, showing that middle class Indian children carry in their guts one-fourth the number of bad bugs that urban slum children have. In urban slums, every child is infected most of the time, even though they may not appear sick. Among the enteric infections, rotavirus causes the most disease; two of five (40 percent) of all children hospitalized with diarrhoea have rotavirus. Other viral, bacterial and parasitic agents are also common.

PRS: You led your team, researchers from Division of Gastrointestinal Sciences CMC, to study the deworming programme in children. Is open defaecation the culprit in worm infections?

GAGANDEEP KANG: Open defaecation does contribute to worm infections in children, particularly for the worms that enter through the skin on the feet, such as hookworm.

PRS: Do you think in a country like India, where contaminated food, water, personal hygiene and sanitary conditions are major risk factors, enteric infections can be curtailed, especially where children are more susceptible and vulnerable?

GAGANDEEP KANG: We really have two choices, do something and recognise that we may not be able to control the disease, or do nothing. It makes sense to keep working at controlling problems, using the tools that are available, and keep scanning the horizon for potential new ways to address the risk of infections. Nutrition has a huge role to play in the growth and resilience of children, and should be an adjunct to direct prevention and treatment of enteric infections.

“Infectious diseases continue to disproportionately kill the poor and the vulnerable in the world.”

PRS: You are known for your inter-disciplinary research in infections in children. What made you pick up rotavirus as your subject of research?

GAGANDEEP KANG: Quite frankly, I worked on rotavirus because when I started, within the diarrhoeal disease space no one was interested in just one tiny virus, when there were more complex and exciting pathogens to investigate. As I continued, I realised just how much rotavirus infections mattered. About 10 years ago we found that if a child needed to be hospitalised for diarrhoea it cost the lower middle class and poor families up to one-twentieth of the annual household income.

PRS: In 2016, the prestigious Infosys Science Foundation awarded you in the Life Sciences category for your pioneering contributions to understanding the natural history of rotavirus
and other infectious diseases that are important both globally and in India. Tell us about the recent status of infectious diseases including rotavirus infections in India and across the world.

GAGANDEEP KANG: Infectious diseases continue to disproportionately kill the poor and the vulnerable in the world. Although non-communicable and lifestyle diseases are increasing, infectious diseases continue to impact public health globally. With global warming, we also have to think about and prepare for the threat of outbreaks of disease, whether spread from humans to humans or though other sources such as animals. The potential for pandemic influenza which could be much worse than H1N1 is very real. The indiscriminate use of antibiotics creates the threat of emerging multi-resistant bacteria. There is a lot for all of us to do in every aspect of society to help control infectious diseases.

For rotavirus, the Government of India is already immunising nearly half of the population, and plans to cover the other half in the coming year. Rotavirus vaccines are not perfect, but they do work and reduce disease. While we work on better vaccines, the government is using available tools to decrease the disease. I am personally very happy that it took such a short time from licensure of the Indian rotavirus vaccines to their introduction into the national immunisation programme. I hope this is a pattern that we continue to repeat.

PRS: Since rotavirus research is close to your heart, we wish to know more about your love story with rotavirus and its impact on public health.

GAGANDEEP KANG: It is a beautiful virus. It has three layers and very ordered spikes that project from the surface. Then it gets in and multiplies in the cytoplasm of the host cell finally releasing daughter viruses. There are rotaviruses that infect animals, birds, and humans, causing disease usually in the very young of the species. It is said that the only continent where there are no rotaviruses is Antarctica, but perhaps we have not looked at penguins carefully! The global distribution shows that rotaviruses are a huge public health problem, and the widespread use of vaccines and the consequent reduction in the disease is a rare and rapid success story in disease control.

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PRS: Vaccines are a boon to human mankind. Immunisations today have made life simpler. And children are the ones who have benefitted the most. They have developed immunity against several diseases and infections in present times. Your work on rotavirus prevention is commendable. Please brief us about the development of vaccines against rotavirus infection.

GAGANDEEP KANG: All currently licensed rotavirus vaccines are live oral vaccines, given by mouth and consisting of one or more types of viruses, which do not cause the disease but induce a protective immune response. In India, we have four licensed vaccines, two made by multinational companies, and two by Indian companies, Bharat Biotech from Hyderabad and Serum Institute of India in Pune. The national immunisation programme uses the indigenous vaccines, which are much cheaper than the vaccines made by multinational companies.

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PRS: Has the public sector vaccination programme begun? Does the World Health Organization (WHO) recommend the Indian vaccine? What is the vaccine dosage regimen?

GAGANDEEP KANG: The public vaccination programme began in 2016 with four states and is now in 11 states. Within the next year, the Ministry of Health intends to cover the whole country. Rotavirus vaccination is recommended for all children by WHO; and the Indian vaccines both have a three dose schedule given at 6, 10 and 14 weeks.

PRS: How effective and safe are Indian-made vaccines? Is there a way to tackle the geographic and chronological variation in the spread of a particular strain of the virus?

GAGANDEEP KANG: In the phase 3 efficacy studies, the two Indian vaccines had an efficacy of 40-60 percent. This is comparable to the multinational vaccines that have been tested in Africa and Asia, showing us that our vaccines are as good as the international marketed vaccines. Rotaviruses are RNA viruses and they change quickly. There is some variable evidence that over time strain changes might take place, but there is no strong signal and no evidence that the vaccines are failing to do their job. With RNA viruses, we have to keep tracking the virus to see if any changes occur that might affect how the vaccine performs. In the efficacy trials, there were no safety issues with the vaccines, but we are conducting much larger scale studies now to monitor safety and expect to have results in the coming year.

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Each group consisted of a Tamil speaker, a half-Tamil speaker, and students are divided into groups that go from house to house meeting the families and filling out questionnaires. Water, sanitation, income, family structure, health conditions, ('dry' for non-irrigated and 'wet' for irrigated), type of house, every aspect of the life of the villagers from the land they own to understand the basis of the poor immune response to oral vaccines, and to develop better rotavirus vaccines. We also work on infections and vaccines in children, particularly the role of micronutrients. The non-communicable disease group at the Institute is focusing on prediction of diabetes risk, working with leading researchers in India, animal models and drug testing for non-alcoholic fatty liver disease, an increasing problem in India. Also, the group is entering into partnerships with leading ayurvedic and natural product manufacturers to work out mechanisms of action for their products, to enable future testing of new remedies. We also work on infections and vaccines in children, particularly the role of micronutrients. The non-communicable disease group at the Institute is focusing on prediction of diabetes risk, working with leading researchers in India, animal models and drug testing for non-alcoholic fatty liver disease, an increasing problem in India. Also, the group is entering into partnerships with leading ayurvedic and natural product manufacturers to work out mechanisms of action for their products, to enable future testing of new remedies.

Finally, and very important again for India, the diagnostics group is focused on point of care diagnostics for acute febrile illness, blood borne viruses, antimicrobial resistance testing, tuberculosis and snake bites. In addition to our own areas of work, we collaborate widely in Delhi, across the country and internationally, to keep moving forward with our mission of using science to support a healthy society.

PRS: For a perfect vaccine, assessment, surveillance and safety monitoring is what we need. You and your team have built national rotavirus and typhoid surveillance networks across the country. Can you tell us something?

GAGANDEEP KANG: Networks are about partnerships. There is not a strong culture of research in India, so training and monitoring are very important components of the work that we do. We have been lucky in our collaborators in government and non-governmental institutions that all of them have been cooperative, hard working and willing to change to achieve higher standards. With partners like we have, such high volume work with detailed data collection becomes possible.

PRS: You have become a trailblazer in the field of vaccines. Is there more research needed to improvise on the present Indian rotavirus scenario?

GAGANDEEP KANG: No question that more work is needed to understand the basis of the poor immune response to oral vaccines, and to develop better rotavirus vaccines. But we also need to monitor impact of vaccines in a real life scenario of introduction into the national programme, particularly in the most vulnerable children, who may be malnourished or have other illnesses.

PRS: Going back to your tenure at CMC Vellore, do you have any particular interesting episode that you wish to reveal? We would love to hear about your story of the girl who was named after you!

GAGANDEEP KANG: The story of the girl who was named Deepa because the grandmother could not understand the name Gagandeep is actually part of a whole series of stories that I and every other medical student from CMC Vellore could tell about the Community Orientation Programme. We spend three weeks essentially living in a village, getting to know every aspect of the life of the villagers from the land they own (‘dry’ for non-irrigated and ‘wet’ for irrigated), type of house, water, sanitation, income, family structure, health conditions, etc. In order to collect this information, the village is mapped and students are divided into groups that go from house to house meeting the families and filling out questionnaires. Each group consisted of a Tamil speaker, a half-Tamil speaker (usually spoke Malayalam) and a non-Tamil speaker. I was the non-Tamil speaker, and my Tamil and half-Tamil speaking classmates are now in Australia and the US and I have been in Tamil Nadu for over 35 years!

PRS: Why is it that we don’t see many women scientists in a leadership role?

GAGANDEEP KANG: We tend to function in the society we live in. Women rarely put themselves forward despite being very capable, perhaps because at the moment it is still a huge struggle to be a leader, in small and big ways. Ideally, women in leadership should happen on its own, but current evidence indicates that change is slow and small. To me, this means that women and men in leadership positions have to make sure that we address the gender gap at each stage of the professional advancement.

PRS: What are the areas of work that your Institute at Faridabad is undertaking? What is the plan for future?

GAGANDEEP KANG: The THSTI has a mission that is exciting and full of potential – discovery and innovation to address problems in public health in India. We work on four main areas. The first is vaccines, infections and immunology focusing on tuberculosis, HIV and dengue, and most recently typhoid and cholera, where I want to use vaccines to study the human immune response in volunteer challenge studies. The second is maternal and child health, where Dr. Shinjini Bhatnagar, an outstanding pediatric gastroenterologist, has taken the lead to establish a pregnancy cohort at the Gurugram Civil Hospital to study pre-term birth with collaborators who are using state of the art tools to find predictive factors. We also work on infections and vaccines in children, particularly the role of micronutrients. The non-communicable disease group at the Institute is focusing on prediction of diabetes risk, working with leading researchers in India, animal models and drug testing for non-alcoholic fatty liver disease, an increasing problem in India. Also, the group is entering into partnerships with leading ayurvedic and natural product manufacturers to work out mechanisms of action for their products, to enable future testing of new remedies. Finally, and very important again for India, the diagnostics group is focused on point of care diagnostics for acute febrile illness, blood borne viruses, antimicrobial resistance testing, tuberculosis and snake bites. In addition to our own areas of work, we collaborate widely in Delhi, across the country and internationally, to keep moving forward with our mission of using science to support a healthy society.

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