

Elevated serum MCP-2 and TARC are associated with increased risk of death in Guamanian ALS patients: a retrospective cohort study

Chowdhury Risana N ^{1,6}, Azam Mus'Ab ², Azam Suhaib A ³, Shteynman Lana⁴, Culver Erin N ⁵, Garruto Ralph M ^{6,7}, Wander Katherine ⁶

¹Department of Child and Family Studies, University of South Florida, Tampa, FL, USA

² SUNY Upstate Medical University, Syracuse, NY, USA

³ University at Buffalo School of Medicine and Biomedical Sciences, Buffalo, NY, USA

⁴ Renaissance School of Medicine at Stony Brook University, Stony Brook, NY, USA

⁵ Colorado Center for Personalized Medicine, University of Colorado-Anschutz Medical Campus

⁶ Department of Anthropology, Binghamton University (SUNY), Binghamton, New York

⁷ Department of Biological Sciences, Binghamton University (SUNY), Binghamton, New York

Email: risana@usf.edu

Phone: (573) 424-5210

Presenter Name: Dr. Risana Nizam Chowdhury

Abstract: Short description of the presentation topic about 250 to 600 words.

Background: This study explores the relationship between serum inflammation and longevity in a high incidence focus of amyotrophic lateral sclerosis (ALS) in post-WWII Guam. Characteristics of this focus include the sudden appearance of the disease in high numbers and the unusually long lifespan seen in some cases without medical interventions. Understanding similarities and differences between Guamanian and sporadic ALS in other populations may help elucidate causal pathways and novel therapeutic targets. This research evaluates inflammation in bio-banked Guamanian ALS patient serum to understand the relationship between immunoregulator levels and survival time.

Methods: This survival analysis evaluates inflammation in bio-banked Guamanian ALS patient serum to understand the relationship between immunoregulator levels and survival time. Sera from 69 Guam ALS cases collected within one to two years of onset by NIH researchers from 1950-1990 were evaluated for 11 regulators of inflammation, using custom multiplex cytokine and single-plex CRP enzyme-linked immunosorbent assay (ELISA). Factor analysis identified two factors that were responsible for ~68% of the variation in the data. Survival analysis with Cox proportional hazards models was used to determine factors associated with time to death.

Findings: Sera from 69 unique Guam ALS cases were studied, composed of 43 males and 26 females. Factor 2 (MCP-2 and TARC) was associated with a 38% increase in risk of death (HR: 1.38, 95% CI [1.19, 1.65], p: 0.00). Individually, MCP-1 (HR: 1.03, 95% CI [1.004, 1.06], p: 0.02), MCP-2 (HR: 1.24, 95% CI [1.08, 1.44], p: 0.00), IFN- γ (HR: 2.34 95% CI [1.25, 4.36], p: 0.01), IP-10 (HR: 1.18, 95% CI [1.065, 1.312], p: 0.00), IL-6 (HR: 1.05, 95% CI [0.998, 1.108], p: 0.06), and TARC (HR: 1.03 95% CI [1.013, 1.044], p: 0.00), were also associated with increased risk of death.

Interpretation: Results suggest that like sporadic ALS cases worldwide, increased serum inflammation in Guamanian ALS is associated with shortened lifespan. Key differences include the lack of association with IL-10 and longevity, and CRP with shortened lifespan, which have been

World Neurology Conference Abstract

reported in other foci. These differences may be attributable to analysis of serum collected early in disease progression (within the first two years) in our sample. Assessing serum levels of MCP-2 and TARC in the early stages of disease may help predict severity and duration in sporadic ALS. Research on the relationship between pathways associated with TARC, MCP-2, and ALS warrants further investigation.

Biography of Presenter about 100 words:

Risana N. Chowdhury is a Biomedical Anthropologist. She obtained her Ph.D. from Binghamton University (SUNY) in Biological Anthropology, she also has an M.A. in Anthropology and an M.S. in Biomedical Anthropology. She has researched Guamanian ALS for over a decade. Dr. Chowdhury is currently a postdoctoral fellow at the University of South Florida-Tampa. Her research interests include evolution and human health, social determinants of health, trauma, evolutionary implications of neurodegenerative disease, inflammation, biological markers, and epigenetic inheritance.

Details of presenting author to be mentioned in certificate:

Name: Risana Nizam Chowdhury, PhD

Affiliation: University of South Florida

Country: USA

❖ Please to attach a recent high-resolution photograph of the presenting author.



Risana Nizam Chowdhury, PhD

Curriculum Vitae

January 2024

Department of Child & Family Studies
College of Behavioral & Community Sciences
University of South Florida
13301 Bruce B. Downs Blvd. MHC 2510
Tampa, FL 33612-3807

10760 Breaking Rocks Dr.
Tampa, FL, 33647
risana@usf.edu
(573) 424-5210

Education

October 2023-Present, University of South Florida

Postdoctoral Fellow, Interventions for Health-promotion in Oncology and Obesity in Pediatrics(I-HOPE) Lab

Department of Child and Family Studies, College of Behavioral & Community Sciences

November 2022-Present, State University of New York (SUNY)-Binghamton

Associate Research Fellow, Department of Anthropology

May 2022-State University of New York (SUNY)-Binghamton

Doctor of Philosophy in Biological Anthropology

May 2018- State University of New York (SUNY)-Binghamton

Master of Arts in Anthropology

May 2009- State University of New York (SUNY)-Binghamton

Master of Science in Biomedical Anthropology

August 2005-University of Missouri-Columbia

Bachelor of Arts in Interdisciplinary Studies

(areas of concentration in biology, chemistry, and Spanish)

Research Interests

Biological markers, inflammation, evolution and human health, social determinants of health, stress and resilience, evolutionary implications of neurodegenerative disease, DNA methylation as a biological response to the environment

Research Experience

Current Projects University of South Florida (USF) Tampa, FL

The lived experience of college students facing food insecurity

With Dr. Rita DeBate (USF College of Public Health), Dr. Marilyn Stern (USF Department of Child and Family Studies and Moffitt Cancer Center), Dr. David Himmelgreen (USF Anthropology), Dr. Acadia Buro (University of New Mexico College of Population Health), Dr. Nashira Brown (Moffitt Cancer Center) and Jocelyn Jarvis (USF Department of Child and Family Studies)

Patient satisfaction, perceived stress and fingernail cortisol in adolescent and young adult (AYA) cancer survivors

With Dr. Marilyn Stern (USF Department of Child and Family Studies and Moffitt Cancer Center), Dr. Sylvia Crowder (Moffitt Cancer Center) and Dr. Farhad Khimani (Moffitt Cancer Center).

May 2018-May 2022 SUNY-Binghamton Binghamton, NY

Dissertation: *Evolutionary implications of neurodegenerative disease: Inflammation and longevity in post-WWII Guamanian amyotrophic lateral sclerosis*, With Dr. Katherine Wander, Dr. Ralph Garruto, and Dr. D. Andrew Merriwether, Laboratory for Anthropometry and Biomarkers and Bio-specimen Archive at SUNY-Binghamton, Department of Anthropology.

August 2015-May 2018 SUNY-Binghamton Binghamton, NY

MA Thesis Paper 1: *Inherited and somatic mitochondrial DNA mutations in Guam amyotrophic lateral sclerosis and parkinsonism-dementia*

MA Thesis Paper 2: *Protein stability in 45-year-old archived sera*

Additional Research: *Qualitative and quantitative analysis of biomarker stability via chemiluminescent enzyme immunoassay in human sera*

With Dr. Katherine Wander, Dr. J. Koji Lum, and Dr. Ralph Garruto, SUNY-Binghamton, Department of Anthropology.

September-December 2007 SUNY-Binghamton Binghamton, NY

Internship at Laboratory of Evolutionary Anthropology and Health *Brain Vs. Serum: A comparative look at mitochondrial deletions and mutations in human brain and serum DNA* with Dr. Ralph Garruto, SUNY-Binghamton, Department of Anthropology.

June 2007-September 2007 SUNY-Binghamton Binghamton, NY

Internship at Laboratory of Evolutionary Anthropology and Health *Mutations in mitochondrial DNA of Guam amyotrophic lateral sclerosis and Parkinsonism dementia patients* with Dr. Ralph Garruto, SUNY-Binghamton, Department of Anthropology.

January-May 2005 University of Missouri-Columbia Columbia, MO

Correlation of C-13 shifts versus sigma values of aromatic carboxylic acids, esters and aldehydes with Dr. Michael Harmata, University of Missouri-Columbia, Department of Chemistry.

Publications

Revised and resubmitted to American Journal of Human Biology:

Chowdhury RN, Armato A, Culver E*, Shteynman L*, Kurien C*, Cradin B*, Nguyen T*, Margolin F*, Kabir N*, Cardona C*, Azam M*, Lum JK, Garruto RM, Wander K. *Qualitative and quantitative analysis of stability for 15 serum immunoregulators over simulated long-term freezer storage.*

Pending submission to The Lancet Neurology: **Chowdhury RN**, Azam M*, Azam S*, Culver E*, Shteynman L*, Garruto RM, Wander K.

Elevated serum MCP-2 and TARC are associated with increased risk of death in Guamanian ALS patients.

Pending submission to American Journal of Biological Anthropology:

Chowdhury RN, Shteynman L*, Culver E*, Azam S*, Garruto RM, Wander K. *Serum inflammation in Guam amyotrophic lateral sclerosis and Parkinsonism dementia: A case-control study.*

In preparation: **Chowdhury RN**, Garruto RM, Wander K. *Evolutionary implications of neurodegenerative disease: Inflammation and longevity in post-WWII Guam ALS.*

In preparation: **Chowdhury RN**, Heydari S, Stern M, Gray H. *Implementation science frameworks for interventions in pediatric obesity: A systematic review.*

In preparation: **Chowdhury RN**, Sauls R, Heflin C, Stern M, Gray H. *Rapid review of lifestyle interventions in adolescent obesity.*

Reiff DM, Spathis R, Chan CW, Vilar MG, Sankaranarayanan K, Lynch D, Ehrlich E, Kerath S, **Chowdhury RN**, Robinowitz L, Lum JK, and Garruto RM. Inherited and somatic mitochondrial DNA mutations in Guam amyotrophic lateral sclerosis and parkinsonism-dementia. *Neurological Sciences*. 2011, **32**, 883–92.

Reiff D, **Chowdhury RN**, Spathis R, Lynch D, Chan C, Wanglund C, Lum JK, & Garruto R. Investigating mitochondrial deletions as contributing factors in Guam ALS and PD. *American Journal of Human Biology*. 2008, **20**, 231-231.

Poster Presentations

Abstract accepted: **Chowdhury RN**. *Biological Markers in Behavioral Medicine*. Annual meetings of the Society of Behavioral Medicine, 2024 March; Philadelphia, PA.

Abstract accepted: **Chowdhury RN**, Garruto RM, Wander K. *Serum biomarker levels and disease duration in post-WWII Guam amyotrophic lateral sclerosis: A survival analysis*. Annual Meetings of the Human Biology Association, 2024 March; Los Angeles, CA.

Chowdhury RN, Azam S*, Pena E*, Garruto RM, Wander K. *Inflammation and longevity in post-WWII Guamanian amyotrophic lateral sclerosis (ALS)*. Poster presentation for the Annual Meetings of the Human Biology Association, 2022 March; Denver, CO.

Azam S* and Pena E*, **RN Chowdhury**, Garruto RM, Wander K. *Effect of modernization on serum c-reactive protein in healthy CHamoru males and females living in post-WWII Guam*. Poster presentation for the Annual Meetings of the Human Biology Association, 2022 March; Denver, CO.

Chowdhury RN, Culver E*, Wattoo U*, Nguyen T*, Margolin F*, Garruto RM, Lum JK, Wander K. *Serum inflammation in Guamanian Amyotrophic Lateral Sclerosis and Parkinsonism Dementia: A nested case-control pilot study*. Poster presentation for the Annual Meetings of the American Academy of Physical Anthropology, 2020 April; virtual.

Chowdhury RN, Azam M*, Culver E*, Cradin B*, Garruto RM, Lum JK, Wander K. *Serum C-reactive protein and neurodegeneration in post-WWII Guamanians: A nested case-control study*. Poster presentation for the Annual Meetings of the Human Biology Association, 2020 April; Los Angeles, CA. (meeting cancelled due to COVID-19).

Culver E*, **Chowdhury RN**, Kurien C*, Shteynman L*, Garruto RM, Lum JK, Wander K. *Qualitative and quantitative analysis of C-reactive protein stability in human sera over simulated long-term freezer storage*

Poster presentation for the Annual Meetings of the Human Biology Association, 2020 April; (meeting cancelled due to COVID-19).

Chowdhury RN, Wander K, Culver E*, Gallo A*, Cardona C*, Kabir N*, Garruto RM, Lum JK. *Qualitative and quantitative analysis of biomarker stability via chemiluminescent enzyme immunoassay in human sera.* Poster presentation for the Annual Meetings of the Human Biology Association, 2019 March; Columbus, OH.

Chowdhury RN, Wander K, Culver E*, Gallo A*, Cardona C*, Kabir N*, Garruto RM, Lum JK. *Qualitative and quantitative analysis of biomarker stability via chemiluminescent enzyme immunoassay in human sera.* Poster presentation for the Binghamton University Biomedical Research Conference, 2019 May; Binghamton, NY.

Chowdhury RN, Wander K, Margolin F*, Cradin B*, Shteynman L*, Kurien C*, Nguyen T*, Garruto RM, Lum JK. *Quantitative analysis of C-reactive protein stability over 50 freeze-thaw cycles.* Poster presentation for Binghamton University Research Days, 2019 April; Binghamton, NY.

Chowdhury RN, Spathis R, Smith N, Garruto RM, Lum JK. *Preservation and degradation of biomarkers in half-century-old sera and dried blood.* Poster presentation for the Annual Meeting of the Human Biology Association, 2017 April; New Orleans, LA.

*Undergraduate mentee co-author

Podium Presentations And Invited Talks

RN Chowdhury, S Azam*, E Pena*, K Wander. Title: "Inflammation and longevity in post-WWII Guamanian amyotrophic lateral sclerosis (ALS)". Sigma Xi Annual Meetings and Student Research Conference, 2021 November, virtual.

Organizer and Panelist, Title: "What we gain: moving beyond the buzzwords to productive conversations about diversity and inclusion". Annual Meetings of the Human Biology Association, 2023 April; Reno, NV.

Panelist, SUNY-Binghamton Health Research Mixer (2018)

Title: "Serum inflammation in Guamanian ALS-PD"

Guest lecturer, Human Biological Variation, SUNY-Binghamton (2017)

Title: "Guamanian ALS-PD and the evolutionary implications of neurodegenerative disease"

Guest speaker, Peopling of the Pacific, SUNY-Binghamton (2016)

Title: "Lytico-Bodig: the unsolved mystery of Guam"

Awards

In preparation for submission to Moffitt Cancer Center Adolescent and Young Adult Cancer Research Fund, \$50,000 (May 2024)

In preparation for submission to College of Behavioral and Community Sciences Internal Research Grant \$20,000 (March 2024)

Richard T. Antoun Dissertation Fellowship Award, Department of Anthropology, SUNY-Binghamton, \$8500 (2022)

Sigma Xi Grants in Aid of Research (GIAR), \$1000 (2021)

**National Science Foundation Doctoral Dissertation Improvement Grant
(second submission ranked Competitive B, not funded) (2021)**

SUNY-Binghamton Harpur Edge Research Grant, \$2000 (2019)

SUNY-Binghamton Research Awards, \$960 (2018)

SUNY-Binghamton Research Awards, \$1200 (2017)

**SUNY-Binghamton Graduate Student Organization Travel Grant, \$600
(2017)**

**Teaching and
Relevant Work
Experience**

Present: January-May 2024 University of South Florida Tampa, FL

**Instructor, Rehabilitation Counseling Services 6740, Research and
Program Evaluation**

August-December 2021 SUNY-Binghamton Binghamton, NY
Instructor, Anthropology 334, Comparative Aspects of Human Growth

January 2019-February 2022 SUNY-Binghamton Binghamton, NY
Online Instructor, Anthropology 240, Medical Anthropology

January-May 2021 SUNY-Binghamton Binghamton, NY
Teaching Assistant, Anthropology 333, Human Genetics

August-November 2020 SUNY-Binghamton Binghamton, NY
Grader, Biology 347, Anatomy and Physiology

January-May 2020 SUNY-Binghamton Binghamton, NY
Teaching Assistant, Anthropology 249, Introduction to Epidemiology

September-December 2019 SUNY-Binghamton Binghamton, NY
Instructor, Anthropology 114, Linguistic Anthropology Discussion

September 2017-May 2018 SUNY-Binghamton Binghamton, NY
**Teaching Assistant, Anthropology 206, Freshman Research Immersion
in Community Public Health**

Mentored 25 undergraduate students in project planning, research methods, conference abstract and poster preparation, and conference presentation.

January-May 2017 SUNY-Binghamton Binghamton, NY
Graduate Assistant, Biomedical Office

January 2008-May 2009 SUNY-Binghamton Binghamton, NY
Graduate Research Assistant, NIH-NINDS Serum Archive

September-December 2007 SUNY-Binghamton Binghamton, NY
**Graduate Research Assistant, Laboratory of Evolutionary
Anthropology and Health**

Skills	<p>Data management</p> <p>Statistical analysis</p> <p>Database and survey-based research</p> <p>Mixed-methods (Qualitative and Quantitative) research</p> <p>Enzyme immunoassay (prefabricated kits and in-house protocols)</p> <p>Polymerase Chain Reaction (PCR)</p> <p>DNA sequencing, gel electrophoresis</p> <p>Serum and dried blood spots (specimen collection, preparation, storage, elution/dilution)</p> <p>Hair and saliva (specimen collection and preparation)</p>
Software Expertise	<p>R Statistical Software</p> <p>SPSS</p> <p>Nvivo</p> <p>Qualtrics</p> <p>Microsoft Office 365 (Excel, Word, PowerPoint, Access)</p> <p>Google Workspace (Sheets, Docs, Slides, Drive)</p> <p>Apple iWork (Numbers, Pages, Keynote)</p>
Professional Organization Membership	<p>Member, Society of Behavioral Medicine (2023)</p> <p>Member, Sigma Xi (2022-present)</p> <p>Fellow, Human Biology Association (2022-present)</p> <p>Member, American Association of Biological Anthropologists (2019-present)</p>
On-campus Affiliations	<p>SUNY-Binghamton Anthropology Graduate Organization (2015-2022)</p> <p>SUNY-Binghamton Graduate Student Organization (2015-2022)</p> <p>Graduate Student Employee's Union (2015-2022)</p> <p>SUNY-Binghamton Parent Collective (2015-2022)</p>
Training and Certifications	<p>Cornell University ILR School Diversity and Inclusion Certificate (2022)</p> <p>SUNY-Binghamton Multicultural Resource Center Inclusive Pedagogy Training (2022)</p> <p>SUNY-Binghamton Fieldwork Bystander Intervention Training (2021)</p> <p>SUNY-Binghamton Online Teaching Certificate (2019)</p> <p>SUNY-Binghamton Anthropology Oral History Workshop (2018)</p> <p>SUNY-Binghamton Environmental Health and Safety training (2015-2022, yearly)</p> <p>CITI Ethics and Safety Certifications (2017-present)</p> <p>IRB Human Subjects Training (2017-present)</p> <p>Certified Instructor of Record (2016)</p> <p>Training the Trainers Course in Trauma Psychiatry-University of Missouri School of Medicine, Department of Psychiatry (2004)</p>

Languages	Native/Bilingual Fluency: English and Bengali Full Proficiency: Spanish Working Proficiency: Hindi and Urdu Elementary Proficiency: Arabic
Service	<p>August 2018-May 2022 SUNY-Binghamton Binghamton, NY Undergraduate Student Mentor</p> <p>Mentored 36 undergraduate students in laboratory methods, grant-writing, conference abstract and poster preparation, and conference presentation.</p> <p>August 2018-December 2019 SUNY-Binghamton Binghamton, NY Graduate Student Organization (GSO) Senator</p> <p>Represented the Anthropology Graduate Organization (AGO) renewing charters and voting on campus-wide policies and decisions on behalf of anthropology graduate students.</p> <p>May 2018 Binghamton University (SUNY) Binghamton, NY Graduate Student Orientation Program Ambassador</p>
Volunteering and Community Involvement	<p>June 2022-Present Girl Scouts of Central Florida Tampa, FL Girl Scouts Parent Volunteer</p> <p>January 2018-February 2020 Girl Scouts of NY-PENN Binghamton, NY Juniors Troop Leader (60233)</p> <p>Mentored 14 girl scouts in philanthropic and education endeavors such as blanket sewing for the Linus Project and World Thinking Day.</p> <p>June 2008-May 2019 Children of Abraham Broome County, NY Participant member</p> <p>Involved in various interfaith activities including meetings, events, dinners.</p> <p>August-December 2006 The Crescent Academy Johnson City, NY Kindergarten Classroom and Sports Day Volunteer</p> <p>June 2004-June 2005 Centro Latino Columbia, MO Afterschool Program Volunteer</p>
Media Coverage and Science Outreach	<p>J Michale. Unraveling a mystery: Research explores longevity and ALS. <i>BingUNews.https://www.binghamton.edu/news/story/3473/unraveling-a-mystery-research-explores-longevity-and-als</i> February 01, 2022.</p> <p>Guest speaker, Community Helpers Series (2019) The Crescent Academy Elementary School, Johnson City, NY</p>

References

Katherine Wander, PhD, MPH
Associate Professor of Anthropology
Director, Laboratory of Anthropology and Biomarkers
Binghamton University (SUNY)
katherinewander@binghamton.edu

Dr. Ralph M. Garruto, PhD, MA
Professor of Anthropology and Biology
Director, Binghamton University Biospecimen Archive
Binghamton University (SUNY)
rgarruto@binghamton.edu

Dr. Marilyn Stern, PhD
Professor of Department of Child & Family Studies
Director, Interventions for Health-promotion in Oncology
and Obesity in Pediatrics(I-HOPE) Lab
Full Member, Moffitt Cancer Center
University of South Florida
mstern1@usf.edu