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### Addressing severe acute malnutrition and anemia in Charnia, Haryana, India

C. Pathak, J. Cavanaugh, V. Aggarwal; Northwestern University, Evanston, IL/US

**Program/Project Purpose:** Severe acute malnutrition and anemia (SAMA) are major causes of maternal and infant mortality in rural India. India's health system faces challenges in tackling the rapidly escalating burden of SAMA due to limited access to healthcare facilities, pervasive poverty, and inadequate infrastructure to effectively treat the population. Upon conducting extensive needs assessments and hemoglobin testing in Charnia, Haryana, India, we found anemia and malnutrition prevalence to be high with over 80% of children and 100% of pregnant women tested in Charnia having hemoglobin levels indicative of anemia. Thus, our primary focus was to analyze the methods of sustainably mitigating anemia rates in rural Charnia, Haryana, India through a community health worker (or health promoter) program.

**Structure/Method/Design:** We performed baseline hemoglobin testing and distributed IFA and Albendazole (deworming) to women and children. The mean hemoglobin level of the 113 individuals tested was 10.08 g/dL, and the prevalence of anemia was 78.8%. Accordingly, we trained health promoters for the experimental group. These individuals were expected to encourage anemia awareness and IFA compliance in their communities. Furthermore, Charnians have a very plain diet consisting primarily of rice, lentils, and potatoes. Lack of a varied diet and general malnutrition only compounds the anemia issue in Charnia. This short-term anemia intervention was assessed in August, 2014. Of the original 113 participants, only 12 remained in the community. Due to the migratory population, tracking and follow up with the study participants was difficult, and the remaining 12 participants' hemoglobin levels were not tested.

**Outcomes & Evaluation:** The results of the intervention demonstrated that: the government's delivery system must be improved for community participation; increased oversight of the health promoters is necessary; and an IFA intervention must be combined with long-term food-based approaches to promote sustainability. However, to target long-term behavior change interventions in Charnia, we conducted focus group sessions with community health workers (ASHAs) serving the Charnia area to better understand barriers facing ASHAs and develop tools to assist ASHAs. Through the focus groups, we found the ASHAs to be open to additional trainings, novel approaches to treating SAMA, and open to implementing mobile health tools in their workflow.

**Going Forward:** Moving forward, we are collaborating with the George Institute for Global Health to develop a smart phone tool that will train healthcare workers in Charnia to assess, refer, and/or treat individuals with anemia and malnutrition. (Unpublished Data, Northwestern Project RISHI, Rural India Social Health Improvement).

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### Interrogation of HHV-8 transcriptome in KS tumors and association with KS presentation and outcomes in Uganda

W. Phipps<sup>1</sup>, J. Orem<sup>2</sup>, J. Kafeero<sup>2</sup>, A. Bakenga<sup>2</sup>, G. Holoya<sup>2</sup>, M. Huang<sup>3</sup>, M. McIntosh<sup>4</sup>, M. Fitzgibbon<sup>4</sup>, A. Wald<sup>3</sup>, L. Corey<sup>4</sup>,

C. Casper<sup>3</sup>; <sup>1</sup>University of Washington/Fred Hutchinson Cancer Research Center, Seattle, WA/US, <sup>2</sup>Uganda Cancer Institute, Kampala, UG, <sup>3</sup>University of Washington, Seattle, WA/US, <sup>4</sup>Fred Hutchinson Cancer Research Center, Seattle, WA/US

**Background:** Kaposi sarcoma (KS) is the most common HIV-associated malignancy worldwide and among the most frequently diagnosed cancers in several African countries, where KS prognosis remains poor. Discovery of new KS biomarkers that improve current staging systems or identify new molecular targets for treating KS could significantly improve outcomes. In vitro work suggests that human herpesvirus-8 (HHV-8) produces several angiogenic, inflammatory, and immunomodulatory gene products that contribute to KS pathogenesis, but data on the expression of HHV-8 genes in vivo remain limited. To identify candidate biomarkers and therapeutic targets, we sought to characterize HHV-8 gene expression in KS tumors of Ugandan adults and to correlate the expression of HHV-8 gene transcripts with KS clinical presentation and outcomes.

**Methods:** KS tumor biopsies were obtained from treatment-naïve HIV-infected adults with histologically-confirmed KS initiating therapy at the Uganda Cancer Institute in Kampala, Uganda. KS samples were stored in RNAlater or flash-frozen and stored in liquid nitrogen; HHV-8 mRNA transcripts were quantified using RNA-Seq.

**Findings:** 48 participants contributed 48 KS biopsies. 11 (23%) participants were women, and the mean age was 34 years (range 21-61 years). The median baseline CD4 T-cell count was 187 cells/mm<sup>3</sup> (IQR 53, 352 cells/mm<sup>3</sup>), and median baseline plasma HIV-1 RNA level was 5.5 log<sub>10</sub> copies/mL (IQR 5.0, 5.8 log<sub>10</sub> copies/mL). The KS biopsies represented a range of tumor morphotypes, including 28 (58%) macular, 18 (38%) nodular, and 2 (4%) fungating lesions. All participants received treatment with ART and chemotherapy; 35 (73%) achieved a partial response, and 13 (27%) had progressive disease or died within the first 4 months of therapy. Based on analyses completed to date, all biopsies had HHV-8 mRNA gene transcripts detected. Highly expressed transcripts in all samples included the known latent gene products Kaposin, vFLIP, vCYC, and LANA, and the lytic gene products vIL-6, vIAP, vCCL-2, bZIP, and ORF75. HHV-8 gene expression differed by tumor morphotype, with nodular lesions expressing higher levels of several lytic genes, including vIL-6 (p=0.01), vCCL-2 (p=0.02), and vIAP (p=0.008), compared to macular lesions. High levels of specific genes were also associated with poor survival, including MIR1 (HR=1.3; p=0.03), vCCL-2 (HR=1.3; p=0.04), and vCCL-1 (HR=1.3; p=0.02). Additional RNA-Seq data will be presented for the entire set of biopsies.

**Interpretation:** KS tumors expressed high levels of both latent and lytic HHV-8 mRNA transcripts. Highly expressed transcripts included several functional genes encoding cytokines (vIL-6), growth regulatory genes (v-CYC), and apoptosis inhibitors (v-FLIP), and the differential expression of these viral genes appeared to be associated with different tumor types. Importantly, several of these gene products represent potential targets of therapy with available drugs and may serve as candidates for future therapeutic trials to improve KS outcomes.

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### The role of HPV testing in reducing the burden of cervical cancer in low and middle income countries

T. Randall<sup>1</sup>, S. Luciani<sup>2</sup>, L. Salicrup<sup>3</sup>, D. Mendoza-Cervantes<sup>3</sup>; <sup>1</sup>Vincent Department of Obstetrics and Gynecology, The Massachusetts General Hospital and Global Oncology Initiative, Harvard Cancer Center, Cambridge, MA/US, <sup>2</sup>Department of Noncommunicable Diseases and